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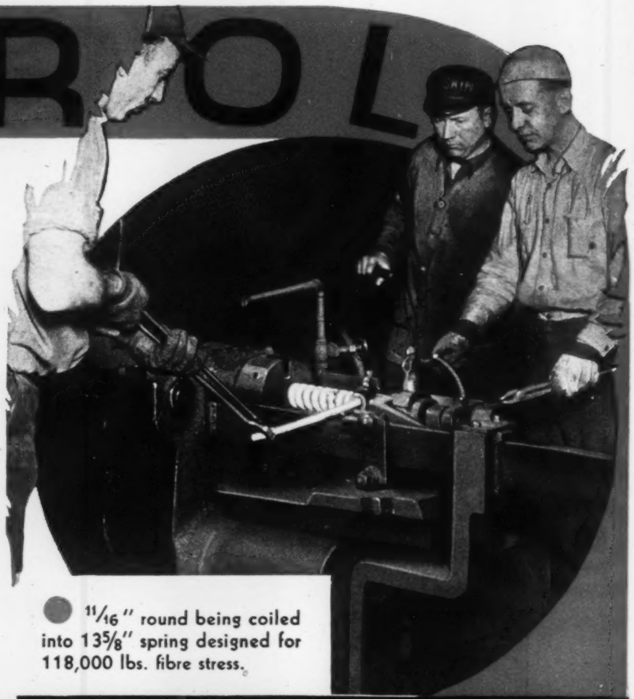
MACHINE DESIGN

AS IT AFFECTS

ENGINEERING—PRODUCTION—SALES

CONTROL

of *our* processes adds economy to *yours*



11/16" round being coiled into 13⅝" spring designed for 118,000 lbs. fibre stress.

Helical springs are claiming a major share of attention these days and the selection of the steel for their manufacture is a matter of considerable importance. Either as a user or a manufacturer of springs, you cannot afford to overlook Carnegie Controlled Steels. Produced by precision methods of manufacture under an exacting system of metallurgical supervision, these steels assure a degree of uniformity heretofore considered impossible in open hearth steels. To the user of helical springs, the benefits of the Carnegie system of control are reflected in a reliable product at a reasonable cost. To the spring manufacturer, the uniformity of Carnegie Controlled Steels insures consistently satisfactory response to production processes.

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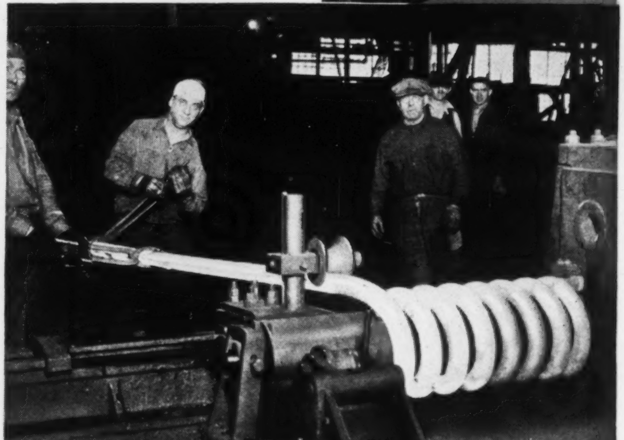
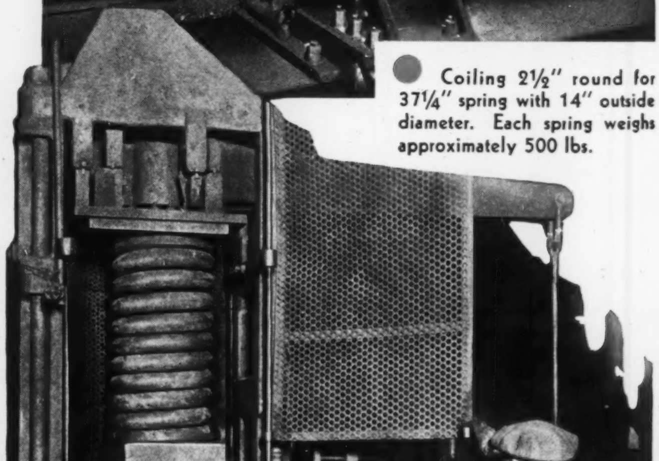


Coiling 2½" round for 37¼" spring with 14" outside diameter. Each spring weighs approximately 500 lbs.



70,000 lbs. pressure being applied to compress spring in closure test.

CARNEGIE Controlled STEELS

MACHINE DESIGN

EDITOR
L. E. Jermy

ASSOCIATE EDITORS
Allen F. Clark
Harold B. Veith
F. H. Burgess

Volume VI AUGUST, 1934 Number 3

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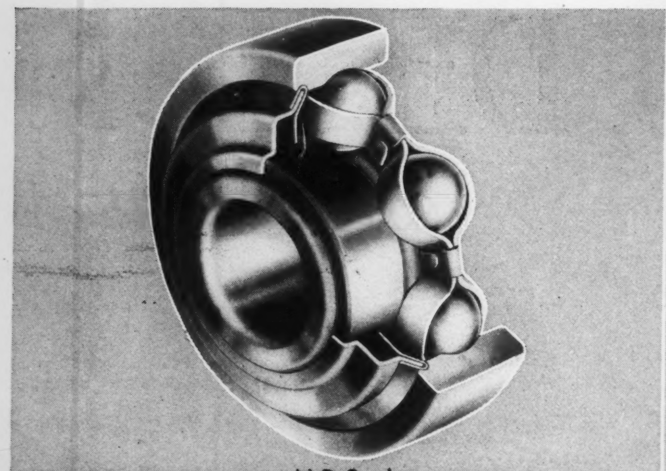
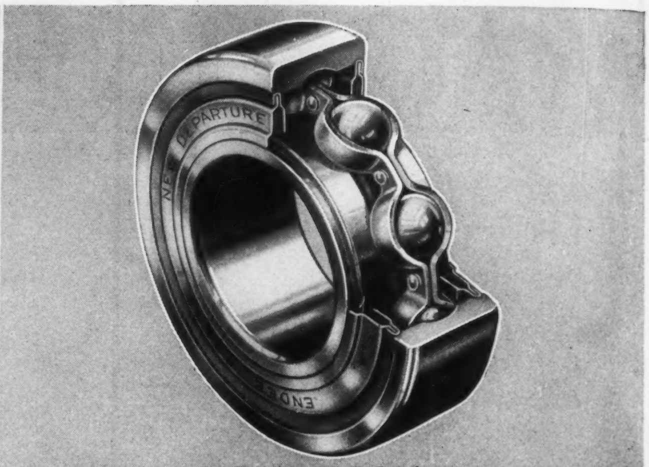


N-D-Seal

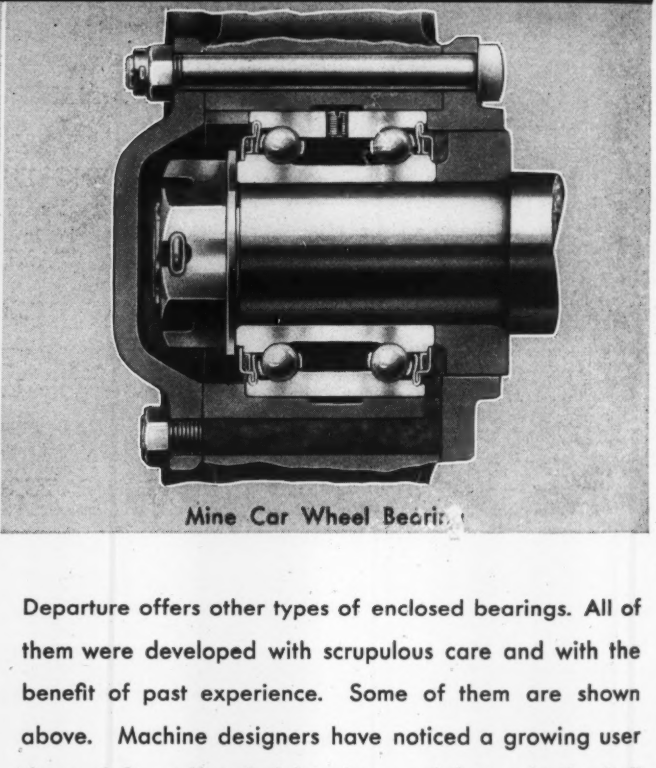


Double N-D-Seal

The Trend is to Sealed Bearings

. . . and that means ball bearings

Conveyor Roll Bearing



Mine Car Wheel Beari[illegible]

THE sealed bearing idea took root about six years ago when New Departure introduced the N-D-Seal Ball Bearing. Machine builders were quick to see the cost-saving features of such a unit. It meant fewer parts . . . faster assembly . . . less machine work . . . greater compactness and avoidance of lubrication worries. »»» In spite of the lean years just passed, over 2 million of these bearings have been put into service, where they have amply proved all claims made for them. »»» Now New Departure offers other types of enclosed bearings. All of them were developed with scrupulous care and with the benefit of past experience. Some of them are shown above. Machine designers have noticed a growing user demand for self-sealed bearings and that only the ball bearing lends itself to such an advancement. »»» Why not work with New Departure on your future designs? Literature on request. The New Departure Mfg. Company, Bristol, Connecticut; Chicago, Detroit and San Francisco.

NEW DEPARTURE BALL BEARINGS

2138

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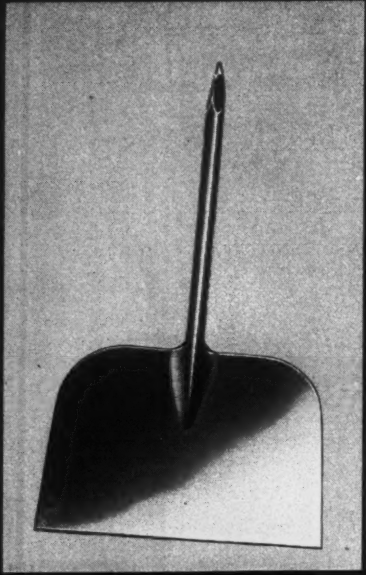

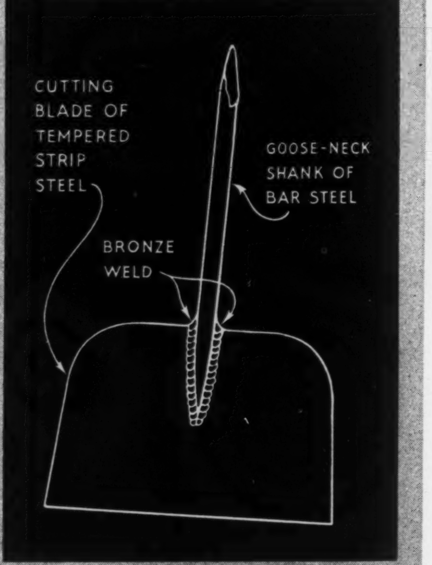
CUTTING BLADE OF TEMPERED STRIP STEEL
GOOSE-NECK SHANK OF BAR STEEL
BRONZE WELD

The joint which makes the blade and shank of this two-metal hoe into one piece is oxy-acetylene welded with bronze. Through the cooperation of Linde Process Service, simple jigs and production procedures were developed. The new hoe is better, costs less and only simple equipment is necessary to make it.

for Sturdier Products
Design for OXWELDING

AT one stroke, adoption of the oxwelded joint solved an equipment problem and produced a better product for a manufacturer of field hoes.

This manufacturer designed a two-metal hoe—the shank to be of a steel selected to withstand shock and fatigue and the blade of a steel made to hold its spring and cutting edge. A new plant was to be equipped for its production. The manufacturer realized that the joint between the shank and blade would determine both the plant equipment and the success of the new hoe.

The Linde Service man who was asked to study this problem brought the wide experience of the Linde organization to the job. With this help the manufacturer developed a joint which would require a minimum of machinery and which would allow full advantage to be taken of special materials. Linde's intimate knowledge of production welding procedures assured low joint cost from the outset.

In this instance Linde Process Service employed a proved method of welding dissimilar metals with bronze welding rod. If, in your manufacturing operations or in your design or redesign projects, you feel that a better understanding of this method might help—call the nearest Linde Sales Office. A trained Linde representative will gladly show you what Linde Process Service can offer. There is no obligation.

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126 Producing Plants UCC 627 Warehouse Stocks
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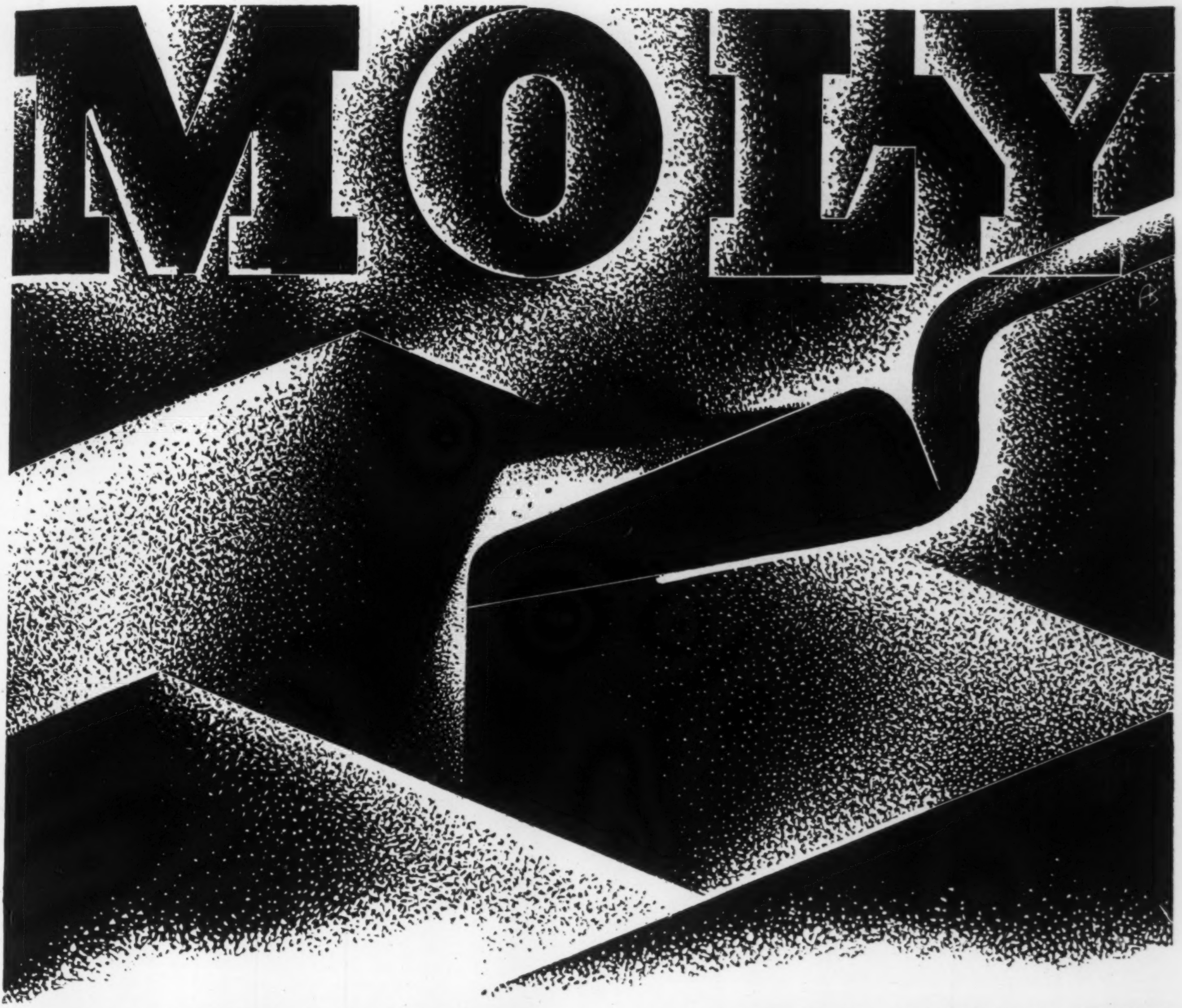
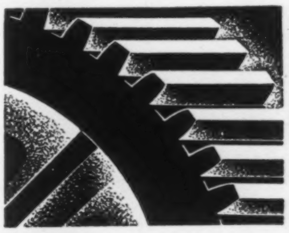


LIKE CEMENT IN SAND . . . A LITTLE DOES A LOT

ONE of the great advantages of the use of Molybdenum is in the fact that a small amount of this versatile alloy does a great deal of work.

In cast iron, for instance: An interesting example is that of a 3000-pound cast-iron gear, the teeth of which had to be hobbed from the original casting. Previous to the application of "Moly," a total of 84 pounds of alloy had to be added to the iron to produce a suitable mix for this purpose. By using Molybdenum, the total alloy addition was dropped to 27 pounds, the alloy cost reduced considerably and the resultant product had a better finish, greater strength, toughness and wear resistance.



In *any* iron, or steel, "Moly" can be depended on to enhance the desirable qualities. Easier machinability, without loss of hardness or toughness, stronger welds, greater corrosion resistance may be added to those already mentioned. And invariably the improvement is worth far more than the cost of the small quantity of Molybdenum required.

"*The Moly Matrix*" is a new house organ designed to help executives and engineers to keep up to date with the new developments in Molybdenum metals. A post-card request will put you on our mailing list. And our metallurgists and modern laboratory facilities in Detroit are ever available to aid in your alloy experiments or problems. Write also for these interesting new books: "*Molybdenum in* 1934" and "*Molybdenum in Cast Iron*—1934 *Supplement.*"

CLIMAX MOLYBDENUM COMPANY, 295 MADISON AVENUE, NEW YORK

CLIMAX Mo-lyb-den-um

How G-E Gear-Motors Help Heald

SIMPLIFY DESIGN

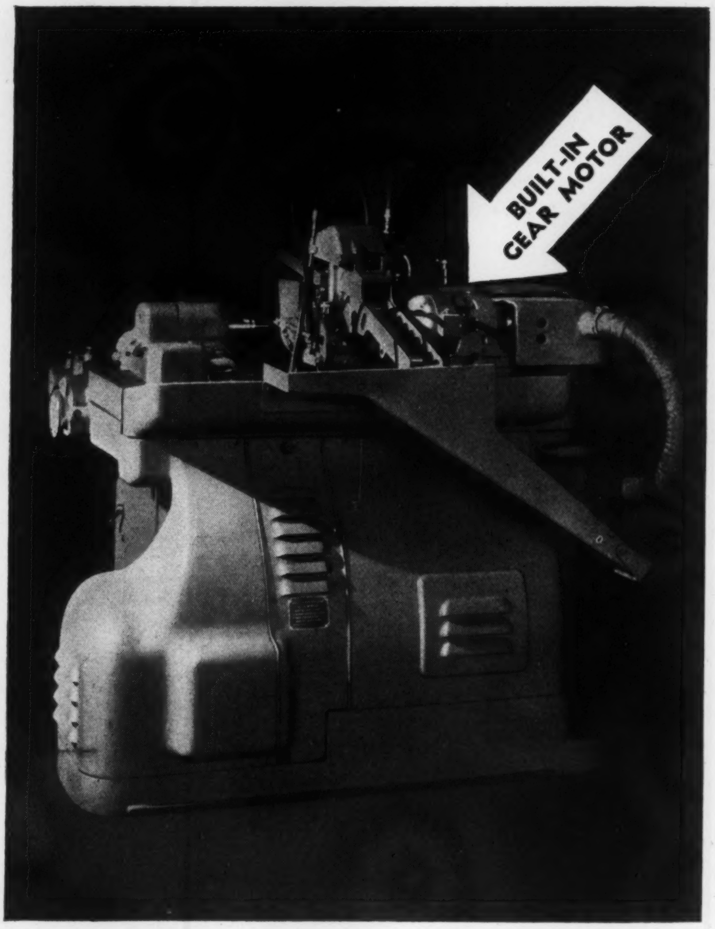
MINIMIZE VIBRATION

ASSURE DEPENDABILITY

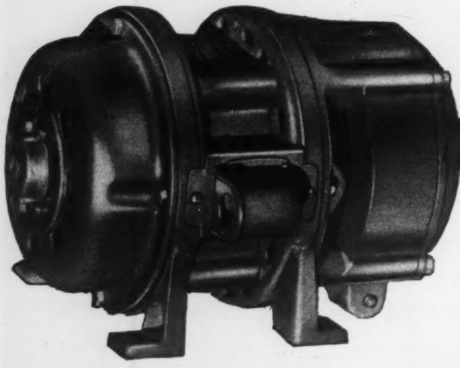
BECAUSE of their uniform torque, excellent balance, and dependable performance, G-E gear-motors provide the required smooth, low-speed drive on the regulating-roll unit of the new Heald Internal Centerless Grinder. The compactness of G-E helical, planetary gear reducers also enables the builders to save space and simplify design.

You, too, will find G-E gear-motors the most satisfactory drives for machines requiring low speeds. They deliver the desired low speed direct to the output shaft. This simplicity, plus the efficient, economical service of G-E gear-motors, will give your machines an important added sales appeal.

Whether you are designing new machines or redesigning existing ones, investigate the advantages G-E gear-motors offer you. For complete information, address the nearest G-E office; or General Electric, Dept. 6A-201, Schenectady, N. Y.



Heald Internal Centerless Grinder, showing G-E 1/4-hp. gear-motor which drives regulating-roll unit at the required low speed. Power on main drive is supplied by a G-E 5-hp. motor.



Left: G-E integral-horsepower gear-motor, suitable for speeds as low as 13 rpm., and available in ratings as high as 75 hp. G-E fractional-horsepower gear-motors are available in ratings as low as 1/6 hp., with output shaft speeds as low as 11 rpm.

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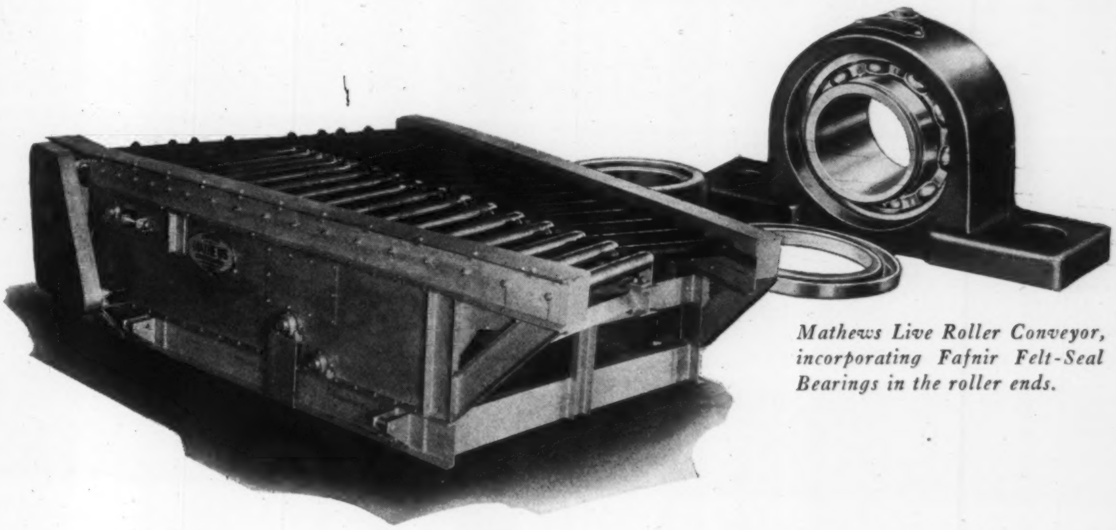
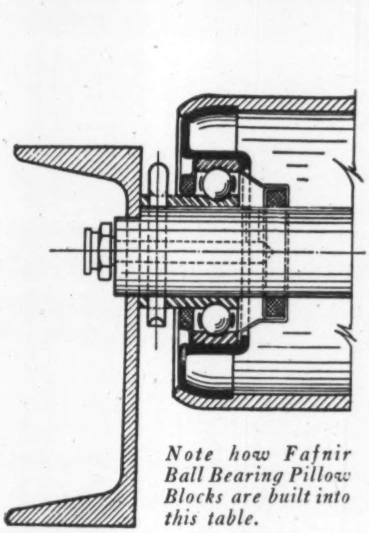
For Continuous Handling

of HOT STEEL SHEETS



Mathews Live Roller Conveyor, incorporating Fafnir Felt-Seal Bearings in the roller ends.

NEW WEAN-MATHEWS CONVEYOR AND CATCHER TABLES USE FAFNIRS



Note how Fafnir Ball Bearing Pillow Blocks are built into this table.

As Mathews says, "The use of high-grade bearings throughout is an important factor in the life of this equipment since the rollers are still only during change of mill rolls, production continuing on a 24-hour basis". Heat must be retained in the sheets between the furnace and rolling mill, hence the surface speed of 250 feet per minute in these tables. And on the built-in ball bearing type roll, a continuous load of 800 lbs. per roller can be sustained.

These facts serve to emphasize the quality which Fafnir builds into every bearing. The deep races and large balls, the scientifically selected alloy steel, the craftsmanship and unfailing inspections all contribute to make Fafnir Ball Bearings outstanding in giving full protection for every gear, shaft and wheel that they support.

Fafnir combines with this quality a wide range of types and sizes which is best described as "the most complete line of ball bearings in America". Specialized engineering service offers designers and builders the assurance that the exact unit most fitted for the job will be selected. Avail yourself of this service. THE FAFNIR BEARING COMPANY, *New Britain, Conn.* Atlanta . . . Chicago . . . Cleveland . . . Dallas . . . Detroit . . . Milwaukee . . . Minneapolis . . . New York . . . Philadelphia.

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FAFNIR BALL BEARINGS

CALENDAR OF MEETINGS AND EXPOSITIONS

Aug. 26-30—

Leipzig Trade Fair.

Fall fair to be held at Leipzig, Germany. Information on the exposition may be obtained from Leipzig Trade Fair Inc., 10 East Fortieth street, New York.

Aug. 27-Sept. 1—

National Association of Power Engineers.

Exposition and annual meeting to be held at Curtis hotel, Minneapolis. Fred W. Raven, 1140 Lake street, Oak Park, Ill., is secretary of the association.

Sept. 3-7—

American Institute of Electrical Engineers.

Annual Pacific Coast meeting to be held at Salt Lake City, Utah. H. H. Henline, 33 West Thirty-ninth street, New York, is secretary of the institute.

Sept. 10—

Technical Association of the Pulp and Paper Industry.

Semiannual meeting to be held at Multnomah hotel, Portland, Ore. R. G. Macdonald, 370 Lexington avenue, New York, is secretary of the association.

Sept. 10-14—

American Chemical society.

Semiannual meeting to be held at Cleveland. Dr. Charles L. Parsons, 728 Mills building, Washington, is secretary of the society.

Sept. 18-20—

Association of Iron and Steel Electrical Engineers.

Exposition of equipment and annual meeting to be held at Hotel Statler, Cleveland. John F. Kelly, 1010 Empire building, Pittsburgh, is managing director of the association.

Sept. 19-29—

National Electrical Exposition.

To be held at Madison Square Garden, New York. Ralph Neumuller, Electrical Association of New York, Grand Central Palace, New York, is general manager.

Sept. 22-27—

American Transit association.

Exposition of equipment and annual meeting to be held in the Public Auditorium, Cleveland. Guy C. Hecker, 292 Madison avenue, New York, is secretary of the association.

Oct. 1-5—

American Society for Metals.

Annual meeting and exposition to be at Commerce hall, Port of Authority building, New York. W. H. Eisenman, 7016 Euclid avenue, Cleveland, is secretary of the society.

Oct. 1-5—

National Safety council.

Exposition and annual meeting to be held at the Cleveland, Statler, Carter and Hollenden hotels, Cleveland. W. H. Cameron, 20 North Wacker drive, Chicago, is manmanaging director of the council.

Oct. 1-5—

American Welding society.

Annual meeting to be held at New York. M. M. Kelly, 33 West Thirty-ninth street, New York, is secretary of the society.

Oct. 8-13—

Brewery Supply and Equipment Exposition.

To be held at Grand Central Palace, New York. Information on the exposition may be obtained from Charles F. Roth, Grand Central Palace, New York.

Oct. 15-20—

Dairy and Ice Cream Machinery and Supplies association.

Exhibition of equipment and annual meeting to be held at Public Auditorium, Cleveland. C. E. Breece, 232 Madison avenue, New York, is secretary of the association.

Oct. 22-26—

American Foundrymen's association.

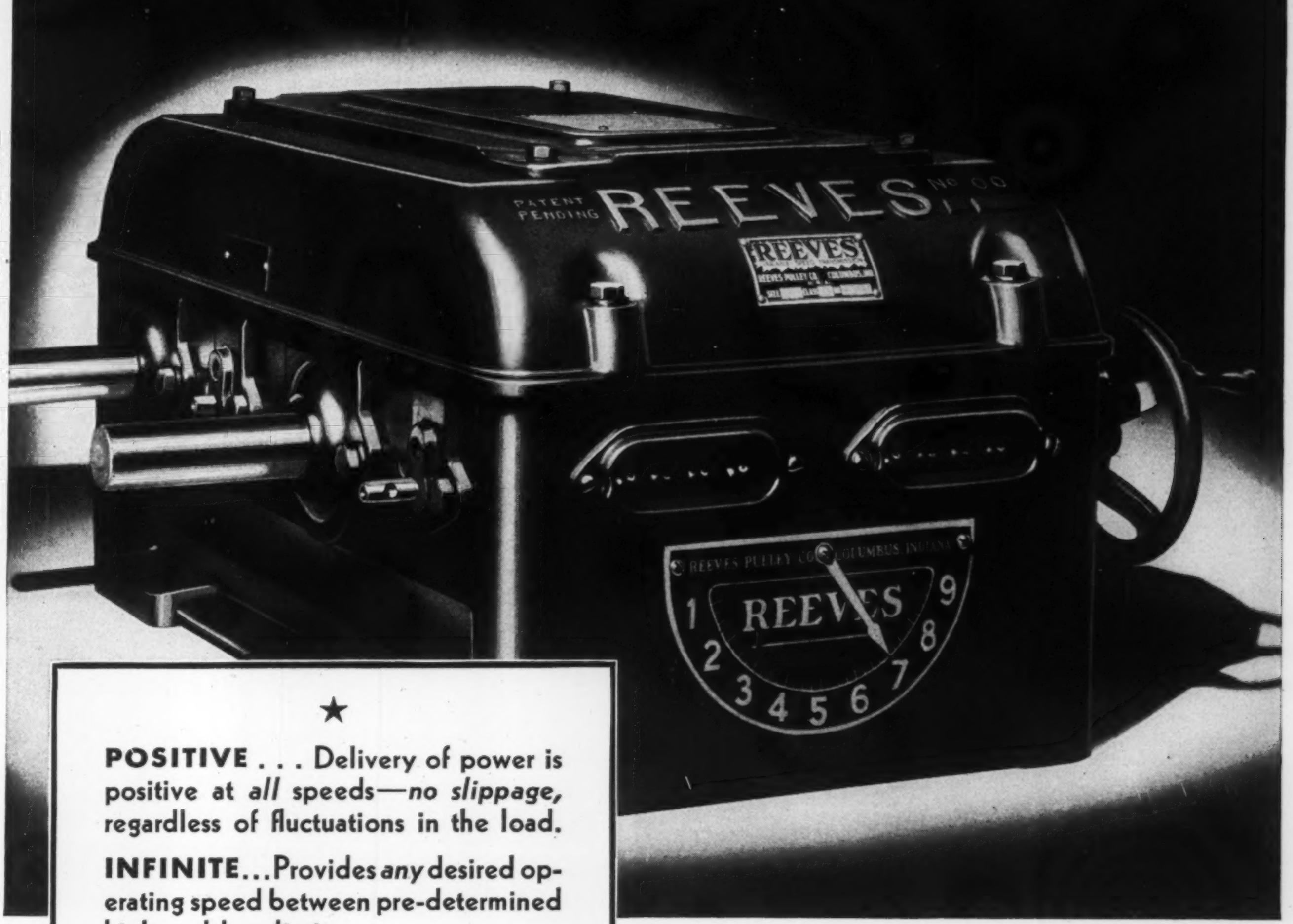
Annual meeting, exposition and International Foundry congress to be held at the Auditorium, Philadelphia. C. E. Hoyt, 222 West Adams street, Chicago, is secretary of the association.

Oct. 29-Nov. 2—

American Gas association

Exposition and annual meeting to be held at the Auditorium, Atlantic City, N. J. K. R. Boyes, 420 Lexington avenue, New York, is secretary of the association.

REEVES COMBINES *all* ★ THESE ESSENTIAL FEATURES



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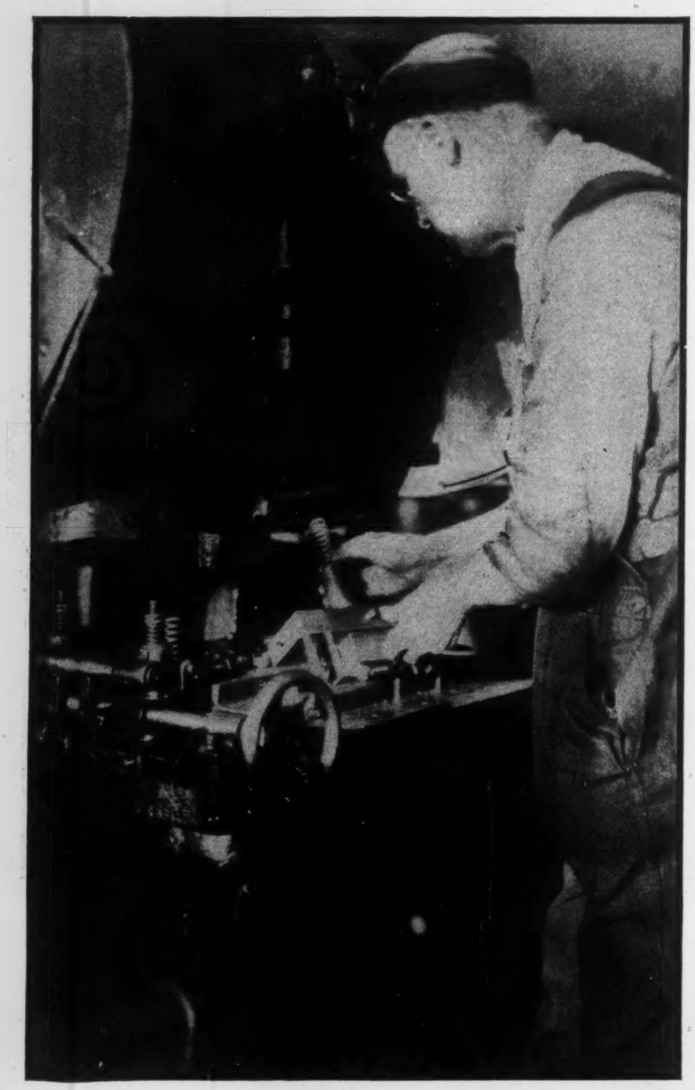
SOLVING UNUSUAL SPRING APPLICATIONS



$$n = \frac{1}{\frac{S_o}{S_y} + \frac{S_v}{S_e}}$$

WITH springs playing a vital part in the operation of most machinery—it is essential that their design be given the utmost care and attention. This applies particularly where special or unusual conditions exist—and where new and untried service is called for. In such instances, formulae, to arrive at a working hypothesis without error, must be based not alone on stress, torsion and other set conditions of operation—but, also, on such important factors as the tensile and fatigue properties of the material used. The thorough familiarity of American Steel & Wire Company technicians with the structural forms of metals—and the application of these metals to spring design—has played an important part in the successful development and use of springs.

American QUALITY Steel & Wire Company SPRINGS

1831 MORE THAN 100 YEARS OF PROGRESS IN WIRE MAKING 1934

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208 South La Salle Street, Chicago
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MACHINE DESIGN
THE JOHNSON PUBLISHING CO., CLEVELAND, OHIO
August, 1934 Vol. 6—No. 8

Mechanical Design Facilitates Observations

By E. P. Burrell
Director of Engineering, Warner & Swasey Co.

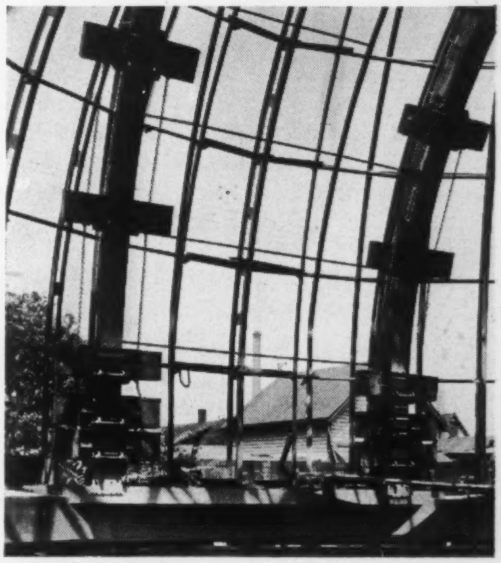
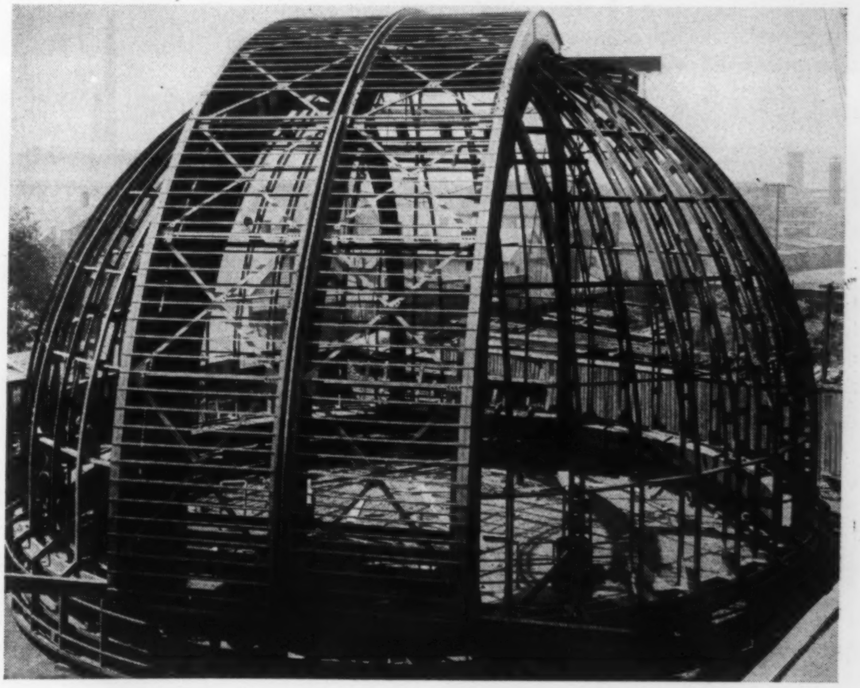


Fig. 1 — (Right)— Exact counterbalancing is accomplished by adding or removing definite amounts of counterweighting at proper intervals. Fig. 2 — (Below)— Steel dome framework is to be covered inside and out with galvanized sheet metal while air is to circulate between the surfaces



GALILEO, squinting at the stars through his first crude telescope, laid the foundation for a line of investigation that has since intrigued the imagination of both scientist and layman. This first astronomer often lay on his back for hours in the damp grass of the summer night to carry out his research. His first observations, faithfully and accurately recorded, brought about his persecution as a heretic.

Today, astronomical discoveries are virtually accepted as law. But the ability of astronomers to make these discoveries has depended upon design developments destined to increase the range, ease and accuracy of their observations. The twentieth century astronomer does not have to expose himself to physical hardship and possible pneumonia, he does not have to depend on things he remembers as seen through almost primitive instruments; the developments in lenses, the invention of the reflecting telescope by Isaac Newton, improvements in photography, and the high state of the art of constructing observatories has ended all that.

The advanced knowledge of the mechanical designer has played an important part in these improvements. For example, the dome for the McDonald Observatory of the University of Texas, soon to house the second largest telescope in the world, includes notable mechanical innovations. As designed by Warner & Swasey Co., this dome is the latest forward step in astronomical equipment. The telescope, which has been designed and is being built by the company, will be mounted on the floor of the dome.

Structural Steel Used

Of particular importance in a great research observatory is the dome, *Fig.* 2, which will permit the greatest range of movement for both telescope and observer with the minimum difficulty in obtaining this range. Structural steel, in the fabrication of which arc welding played an important part, is used to form a semispherical structure which is to be mounted on top of a two-story circular building.

As the entire dome must rotate in order to permit the astronomer to follow the star under observation, or to shift to another section of the sky, an important job was the provision of means for turning this 150-ton roof. First, extreme care was taken to insure perfect balance and thus reduce the power needed for turning. In the final design a five horsepower motor, *Fig.* 3, working well within its capacity through a worm gear reducer, provides the motivating force. The dome turns on 26 cast semisteel wheels mounted on roller bearings protected against the elements by graphite composition packings. To eliminate the possibility of the wheels "running off," they were constructed so that their rims form a frustrum of a cone with its vertex at the center of the dome. With the rails planed and ground to a similar bevel, the ease of turning is materially advanced. Guide rollers, bearing on either side of the rail, assist in maintaining stability.

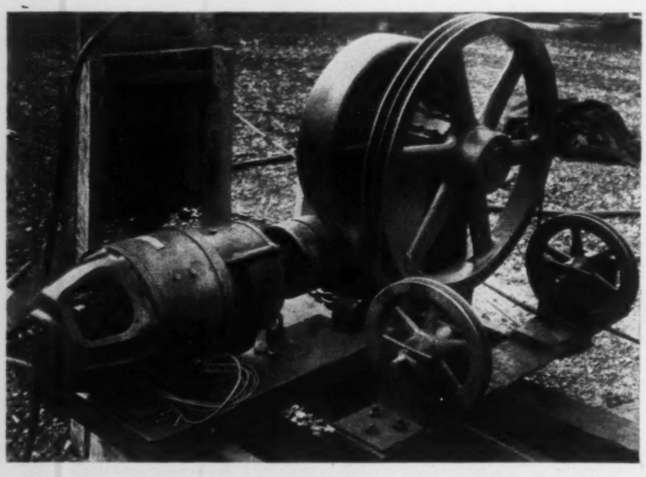


Fig. 3—Dome driving motor transmits its force to revolving structure through tension in wire rope

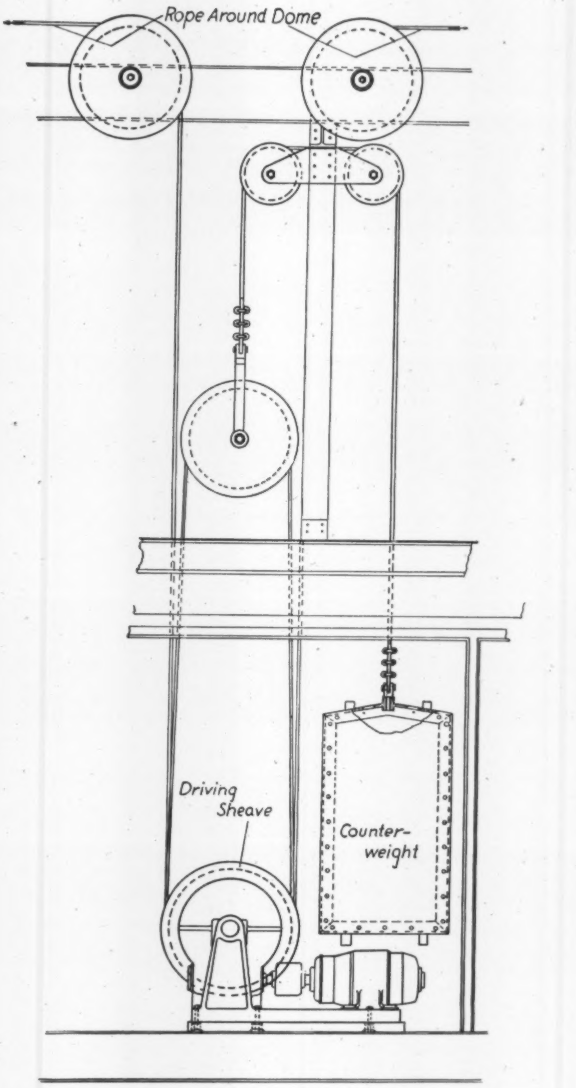


Fig. 4—Auxiliary sheave connected to a counterweight insures proper tension in driving cable

Steel Cable Is Endless

An endless steel cable transmits driving force to the dome, thus permitting it to be rotated continuously in either direction. This cable runs from a circular track around the inside of the dome to a sheave on the framework, down through the side of the structure to the floor below, around the driving sheave on the reducer, up over a counterweighting sheave, back through a second groove on the driving sheave and up again to a second sheave on the framework and again to the circular track as shown in *Fig.* 4. Proper tension on the cable is maintained by the counterweighting sheave which is itself attached to a steel cable running over two auxiliary sheaves to the counterweight.

All of these sheaves, with the exception of the driving sheave, run on roller bearings, as do all of the many other sheaves in the mechanism. These sheaves are protected against the elements by either unit oil seals or graphite composition packing, while lubrication is by pressure gun applied to the individual points

Fully Protected Motors Used

The unusually wide opening in the dome, through which the observations will be made, is closed by two 8-ton shutters which can be seen in *Fig.* 2 extending along a half circle from the base ring well past the top of the dome. This again presented a driving problem for opening and closing. Here a fully protected motor, operating through a worm gear reducer, moves the shutters by means of cables attached to the top and bottom of each shutter. This motor and reducer, as are the driving units for the wind curtains and bridge elevating mechanism to be discussed in the following, are mounted in a compartment just under the shutter opening. Worm gear reducers were employed because of the need for large reductions in speed in a narrow space, while a flexible coupling in which four rubber blocks are contained within two pressed steel members connects the two units. The reducers are connected to the cable drums by open spur gearing. The wheels on which the shutters ride and their guide wheels, following the adopted precept, are mounted on antifriction bearings.

Must Shield Against Wind

The necessary stability of the telescope during photographic operations made it imperative that there be some shield over the shutter opening when the shutters are rolled back, to protect the instrument from vibrations generated by the wind, and to eliminate eddies in air which would hamper photography in much the same manner that water eddies hinder observation. Therefore, wind curtains that can vertically close the 16-foot wide opening are provided. There are two of these curtains, one being raised by cables from the base of the opening, while the other comes over the upper portion from the back of the dome. Their arrangement necessitated a drive for movements of the upper curtain in both directions, while the lower one is raised only, it being allowed to drop back in place by gravity. It might be of interest to note that the lower curtain can be raised high enough to allow the telescope to point out almost horizontally beneath it. The curtains themselves are merely canvas sheets arranged on a series of tubings, connected by chain and being carried by roller bearing-mounted rollers running in guide rails.

By far the most important mechanism in the structure is the bridge, *Fig.* 5. Observations must be possible for any angle to which the telescope may be pointed. Therefore the bridge has been designed to travel along the half circle of the arc of the dome following the telescope as it is raised or lowered. Two pulpits on this bridge may be adjusted further to get absolute positions. The bridge is carried on trucks up and down the curved main ribs on either side of the shutter opening. Provision has been made so that the astronomers can reach this bridge at any point of its travel by means of an arc-welded stairway.

The bridge is raised and lowered by the cable arrangement used for practically all major motions in the structure, except in this case a dynamic brake is an additional provision, but the problem of keeping the bridge level during its operation was a major one. This is accomplished by a cable, fastened at the base of the structure, which runs over sheaves to a guide on the bridge carriage. This guide leads the cable to sheaves on the carriage or to the sheaves on the dome framework, depending on direction of bridge travel. One of the sheaves is mounted at the upper end of the carriage, at *A Fig.* 5. From this point the cable runs to still another sheave *B* on the arm of the bridge. Two complete loops of the cable are made between these two sheaves; it is then brought back and fastened to the arm. The upper structural member of the bridge is hinged to the carriage at *C*. It can be seen that as the bridge is raised the cable circling the sheaves is shortened, thereby bringing the two sheaves closer together, raising the bridge about its pivot point and maintaining the very necessary horizontal position of the bridge.

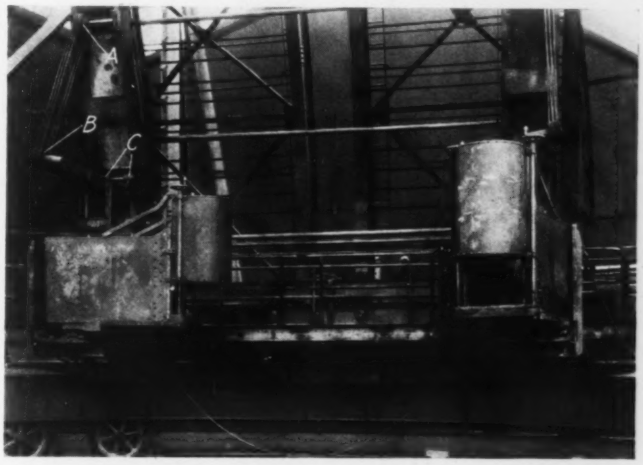


Fig. 5—Observing bridge, which travels around the curved ribs is motivated by a motor worm gear reducer

A means is also provided for moving the two pulpits, located at either end of the bridge, *Fig.* 5, closer to or further from the center of the bridge. This is accomplished by a motorized worm gear reducer, *Fig.* 6, selected because of space considerations, which is suspended from the base of the pulpits. The action is transferred to a rack which runs completely across the bridge.

Two further movements of the pulpits were necessary. One of these permits turning them out from the bridge structure, while the other allows either pulpit to be raised above the level of the bridge. Both of these movements are accomplished through handwheels. The turning movement is carried through a circular rack, while the platforms are raised by twin screws, connected together and connected to a sprocket on the shaft of the handwheel by chains. Motorized mechanisms were considered for these two movements, but these were abandoned in consideration of the oftentimes very small movements required and of the fact that the interest of the astronomer in his observations might lead him to neglect the motion when once started and cause the pulpit to crash into the telescope.

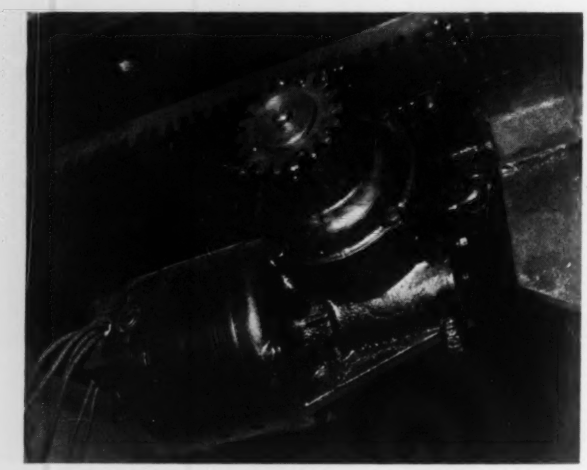


Fig. 6—Gearmotor, suspended from the floor, carries pulpits transversely across the bridge

Weight Added Progressively

The power necessary to raise the pulpit was reduced considerably by the introduction of an ingenious system of counterweighting. It is apparent that as the bridge nears the top of the dome, the carriage assumes a more nearly horizontal position and the vertical component of the weight resisting action need not be nearly as great. Inasmuch as the speed of the bridge had to be as nearly constant as possible, the bridge structure is connected by cable which runs over the main ribs to the system of counterweights. These counterweights, *Fig.* 1, are a number of welded sheet metal containers, each carrying a calculated amount of weighting and interconnected by chains. As the bridge rises, the containers in turn come against a stop at the base of the dome, or come to rest on top of each other, their connecting chains folding into the container already in place. Thus the weight is removed from the system in exact amounts. Each counterweight, with container, is carried by rollers running in guide rails.

Controls Conveniently Placed

With all of these various movements possible, it is little wonder that care had to be exercised in designing the electrical controls. Another factor was that these controls had to be available to the astronomer when he wanted them at just the place where he could use them without running back and forth from his observations. Therefore, push button stations for the dome turning and bridge movements are located in both pulpits as well as in the center of the bridge. In the pulpits there is an additional push button station for moving the pulpits transversely across the bridge. These three push button stations are, furthermore, mounted on a board which can be hung in just the position in the pulpit where the observer can reach it most easily at any time.

In addition to placing a set of dome and bridge controls at the center of the bridge, there is also included here the controls for the shutters, both upper and lower curtains and two quick movements for the control of the telescope. These multiple controls at the bridge center consist of a standard selector switch for the operation to be performed, and a master switch. All controls, including those for telescope movement located at other points, are positively interlocked through relays so that there will be no conflicting movements that might result in damage or danger to the observers. When any one master switch is moved to an operating position, no other movement can take place until it is again moved to neutral.

Large Wire Used

Electric power is carried to the magnetic switch boxes and the controllers, mounted on the revolving dome, through ten trolley wires which encircle the dome. This wire, of an unusually large size to prevent sagging and consequent short circuiting in the limited space, has a figure eight cross section.

Another mechanical refinement incorporated in the dome is the provision for platforms at the base of the telescope by which the observer can raise himself and his equipment from the floor of the dome to the observing position at the lower end of the telescope. These are similar to standard hydraulic lifts with the exception that there are two single play valves employed, one for up and one for down, in order to eliminate any leakage that might change the position of the astronomer in the slightest degree, once this position had been established.

SCANNING THE FIELD FOR IDEAS

THE value of an idea lies in its practicability. This factor should be uppermost in the mind of the man who conceives it. Yet each year thousands of ideas, in patentable form, never bring their owners a penny because the inventions for which they were granted have no market. This department covers only ideas that have been or can be put to practical use, and perusal of these columns is proving distinctly helpful to readers.

SHAFT FLOATS IN GROOVELESS RACE

BALL BEARINGS with grooveless outer races are being utilized more frequently in attaining floating action or endwise movement of shafts. A typical instance occurs in a viscosity regulator recently developed. This machine, like the well-known consistency regulator for pulp and paper stock, receives its regulating impulses from a slowly revolving agitator suspended in liquid, the viscosity of which is to be controlled. Any increase or decrease in viscosity, as reflected by varying rotative resistance of the agitator, is transmitted by sensitive mechanical means to a needle valve which admits just enough thinning solvent to maintain constant viscosity within close limits.

A motor drives the agitator through a train of gears including the floating worm, *Fig.* 1, endwise movement of which is controlled by the resistance imposed on the agitator by the liquid. When the liquid becomes heavy, thus slowing up the agitator, the worm acts as a screw on its complementary gear to carry the shaft in an axial direction, thus opening the valve through lever mechanism. The grooveless outer race of the ball bearing, of course, permits this endwise movement. Sliding action is provided for between the driving gear on the shaft of the motor and the driven gear on the end of the floating worm shaft. Merritt Engineering & Sales Co. Inc. is manufacturer of the unit.

ENGINES OPERATE ON THEIR SIDES

LAYING the motors on their sides, Allan H. Lockheed in designing his new airplane, the Alcor, has introduced a unique idea in aircraft engineering. The two aircooled units are housed in single motor mount in the nose of the plane. Both, however, are entirely independent of each other with separate starters and oil supply. The installation lends itself to streamlining and gives the pilot a wide range of unobstructed vision *Fig.* 2, page 20.

The combined weight of these two six-cylinder

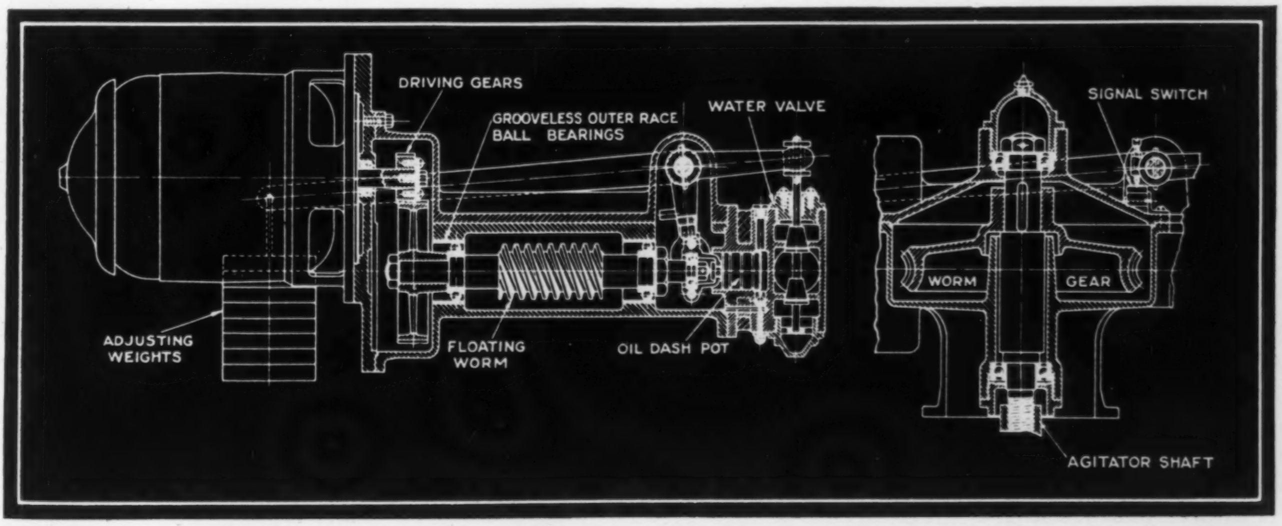


Fig. 1—Grooveless outer race of ball bearing on the end of a floating wormshaft permits endwise movement to control needle valve of a viscosity regulator

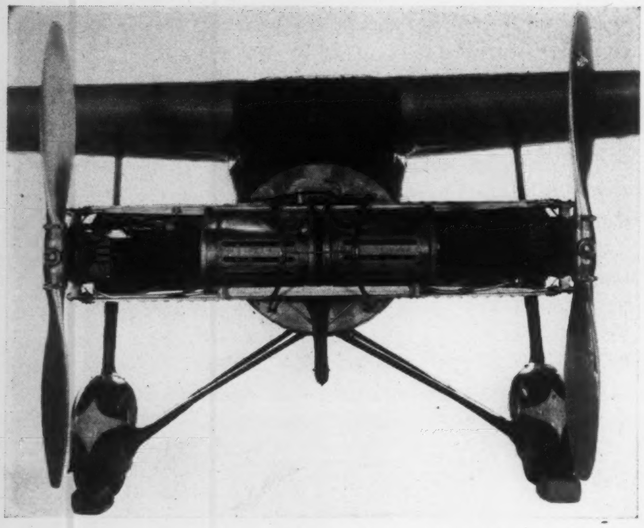


Fig. 2—Two airplane engines laid in a horizontal position facilitate better streamlining and visibility

power plants is said to be slightly in excess of a single radial engine of equivalent horsepower. This small difference, the designer contends, is more than compensated for in the streamlined mounting of the two engines which reduces head resistance to approximately two-thirds that of a single radial engine installation. The horizontal position into which these engines are placed is reminiscent of the pancake type engine (M. D., Dec., 1932) developed by White Motor Co.

MAKING SHRINK FITS WITH DRY ICE

USE of dry ice for contracting metal parts prior to making shrink fits is an idea that has grown rapidly. Indications are that it will continue to provide a process that engineers will specify to an even greater degree. With this in view new data presented by W. H. Swanger, national bureau of standards, at the recent A. S. T. M. meeting, is worthy of note.

In his investigations he used three combinations of material, namely a brass ring on a brass pin; a steel ring on a brass pin; and a steel ring on a steel pin. The cylindrical rings were 1 inch long and 1 inch in internal diameter assembled on pins which at room temperature were about 0.0015-inch larger in diameter. As a result of the experiments it was indicated that in shrink fits made by cooling the inner member, seizing does not occur until relative motion has taken place between the two contacting surfaces, and after seizing has occurred the force necessary to continue the separation of the fitted parts is very much increased.

For example, the first combination mentioned supported a load of 2200 pounds before initial slip occurred, and a maximum of 4370 pounds was required to continue slippage. With a steel ring on a brass pin the initial slip did not take place until a load of 5400 pounds had been applied and a maximum of 6800 pounds was reached to continue slippage. The steel ring on the steel pin did not slip until a load of 5725 pounds was applied, and as in the other two cases the load decreased immediately, but then increased rapidly until a maximum of 19,000 pounds was reached. Failure of the brass to seize was undoubtedly associated with the particles of metallic lead disseminated through the alloy, whereas the presence of the brittle sulphide particles in the steel is responsible, at least in part, for the tendency of the steel to score the brass.

APPLYING PAINT CENTRIFUGALLY

CENTRIFUGAL force, that amazing natural phenomenon which has been so effectively used in a great many designs, has found a place in paint spraying machinery where it has been utilized to increase the comfort of operators, simplify the painting, and eliminate the necessity for considerable equipment. In the Norris electrical painting machine, *Fig.* 3, the entire equipment consists of a fractional horsepower motor, a tank which will hold three pints of paint, valves and the distributor used to force out the paint.

Paint, feeding by gravity into the bottom of the pump housing, *a,* is drawn up the spindle through spiral grooves, *b,* to a series of plates, *c,* that are dished downwardly. The centrifugal action of these plates throws the paint out through the opening and on to the surface to be painted in an even, fan shaped spray. This spray has none of the fog characteristics of the usual paint spraying machines and the paint being applied does not rebound from the surface being treated. Thus it is not necessary for the operator to wear a mask when doing the painting, nor is it necessary to suspend usual working

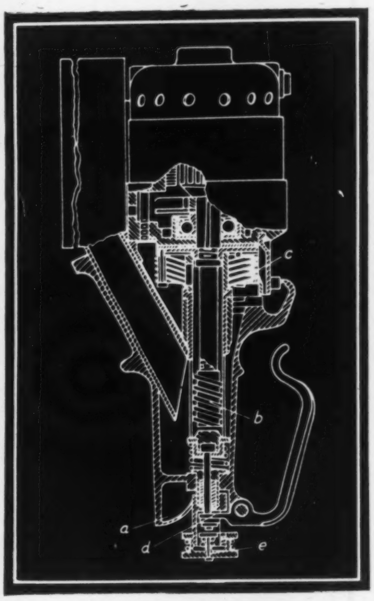


Fig. 3—Centrifugal action of a series of dished plates throws paint out through an opening, providing an even fan-shaped spray. Fog characteristics of the usual paint spraying machines thereby is eliminated. Weight of the unit is five and one half pounds, a figure obtained by the use of die cast aluminum for the motor case and other portions of the unit

operations in the room being painted or even suspend them near to the wall being surfaced.

Construction of the opening through which the paint is distributed enables the holding of a fine line at the outer edge of the spray, while the width of this opening may be adjusted so that the width of spray ranges from about 3/8 to 18 inches. A further adjustment is enabled in the operating valve which admits the paint to the spindle. This valve, d, held closed by a compression spring, is opened by the operator with a trigger action while the amount of opening can be adjusted at e to permit just the right amount of paint to be distributed according to the heaviness of coat desired or the type of paint or enamel being used.

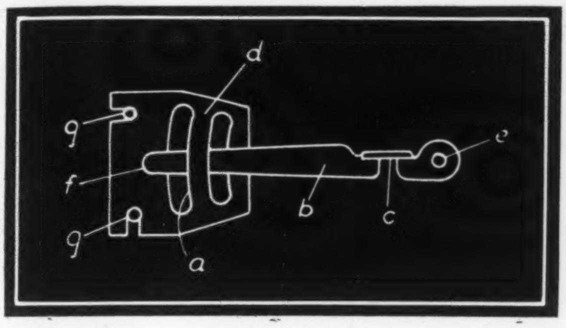


Fig. 4—Traverse motion of strain gage scratch arm is regulated by stiffness of spring and friction

PUTTING FRICTION TO GOOD USE

UTILIZING the difference between the coefficients of static and moving friction, a scratch recording strain gage, *Fig* 4, recently was brought to the attention of engineers. This instrument records deformations below the elastic limit of from 0.0001 to 0.050 inch, over a 2-inch gage length. The device consists of a target a and a scratch arm b carrying a special abrasive, held under spring contact with a polished chrome plated recording surface.

Between the clip bar on target a and the spring arm is a generous amount of friction. The device is fastened in place on the surface to be strained, with the arm in the center of its line of travel. The arm then is moved over to one or the other side of the target, bending spring fulcrum c. The friction is sufficient to prevent the return of the arm to the center under static conditions, but when the distance between the gage points g and e is changed, the transverse force due to spring c, causes arm b to move slightly toward the center with each longitudinal slip of the arm under clip bar a.

Transverse motion of the scratch arm is regulated by the stiffness of the spring and the friction. The latter can be varied widely by bending bar a to a higher or lower level as compared with the level of the target. If several thousand stress variations are to be recorded, and the motion is a simple one in which harmonics are of no interest, the friction can be high and the traverse travel small. If at the other extreme, the problem is one of harmonic analysis, the scale must be opened up to show the details of small deformations.

The recorder, introduced by Baldwin-Southwark Corp., weighs two grams and therefore is light enough to attach to rapidly moving parts of high speed machinery, or on airplane propellers where there is high centrifugal force. It may be employed for recording high rates of vibration such as harmonics up to the sonic range.

WATCH NONMETALLIC MATERIALS!

ENGINEERS are looking to nonmetallic materials as the answer to problems requiring machine parts that can be produced by more economical manufacturing methods. In special conveying equipment designed by the Lamson Co., this is particularly true. Parts such as shown in *Fig.* 5, are molded of bakelite and are being embodied in conveying equipment installed in a number of shoe factories.

Some of these parts come in direct contact with the shoes, and are exceptionally well adapted to this type of work because their smooth finish prevents injury to the product and eliminates the need for a special padding or covering. Other molded parts are employed directly in the mechanism of the conveyor, serving as cams and other mechanical parts.

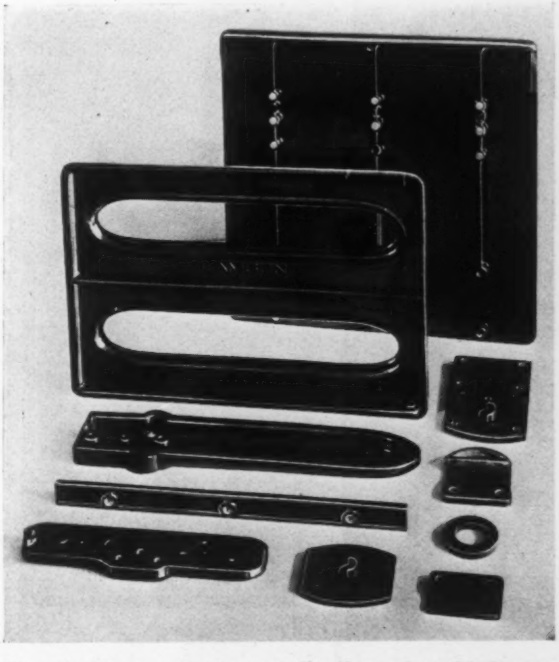


Fig. 5—More extensive application of molded nonmetallic materials includes various machine parts

Sealed and Shielded Bearing A

By Allen F. Clark

MACHINE parts that combine several necessary details into a single unit always find a warm place in the designer's heart. When, in addition to the ease of application, the parts have a greater life with maintenance reduced to a minimum, they are assured of success. Bearings with shields and seals possess just these qualities. By incorporating dust and grease closures in the bearing design, they eliminate considerable detail and greatly facilitate assembly. As the double sealed types are correctly lubricated at the factory there is less possibility of faulty or insufficient lubrication, and renewal of the lubricant can be entirely forgotten for long periods after installation.

Designation of the bearings has followed the general practice of specifying bearings incorporating a single plate as "shielded bearings" and those incorporating a felt ring as "seal type bearings." There are many variations in each type, each variation offering definite advantages to the designer. The principle of the closure may be to keep grease in or to keep dirt out. The plate type of bearing is the one intended to shield from the intrusion of foreign material while the sealed type is intended to retain the lubricant.

These bearings simplify mountings to a large degree, supplement other applied seals and save machining costs, lubrication, space and assembly time. Further, the seal is applied accurately and the ultimate cost is usually less than that of a separate bearing and several sealing parts.

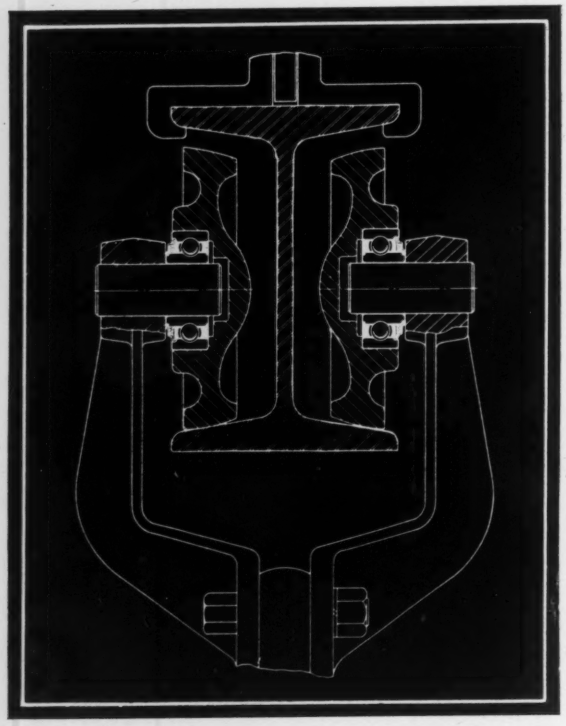


Fig. 1—Sealed bearings retain lubricant and exclude dirt on trolley type conveyor

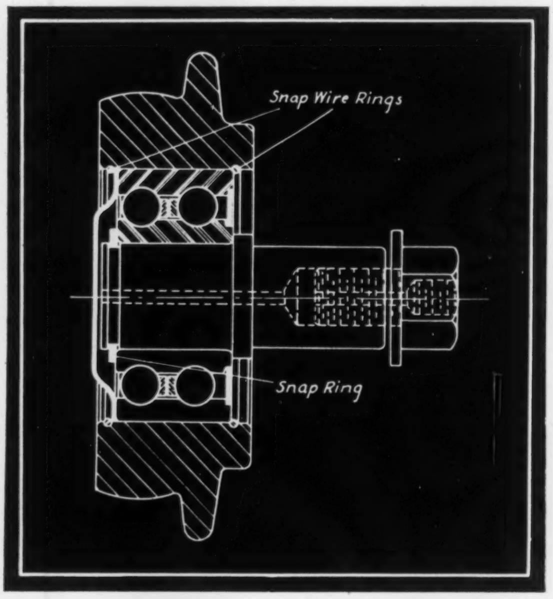


Fig. 2—For very slow speeds plate type bearings should be packed with grease

Despite their advantages, double seal and shielded bearings should not be used indiscriminately. The best procedure is to consult the manufacturer of the bearings on all applications which are unusual to any degree. On the other hand, however, ball bearings of the single seal type, that is with an integral seal on one side of the bearing only, have little variation in the conditions limiting their application over those applying to regular nonsealed bearings.

A great many double seal bearings for general use are intended to function without relubrication, and, in order that they may be assured of normal life and service, it is necessary to place certain restrictions upon their application. Service conditions vary so considerably that it is difficult to lay down any fixed rules. The selection of a suitable lubricant is a most important con-

Aid in Design Simplification

sideration. Felt seal bearings should not be used where thin oil must be employed as a lubricant, therefore, temperatures, particularly if continuous, should not run above 140 to 150 degrees Fahr. and speed, which is the other principal factor affecting the lubricant, should not exceed 2000 revolutions per minute. These speed limitations do not apply to the single seal types, although they should not be applied to spindles where the speed may be as high as 20,000 or 30,000 revolutions per minute without reference to the bearng manufacturer. In special instances, where the applications are studied and approved by the manufacturer, abnormal speed or temperatures for double sealed units may be deemed permissible. For example, single seal bearings are being used in certain air driven tools running up to 50,000 R.P.M. This is not continuous service, however.

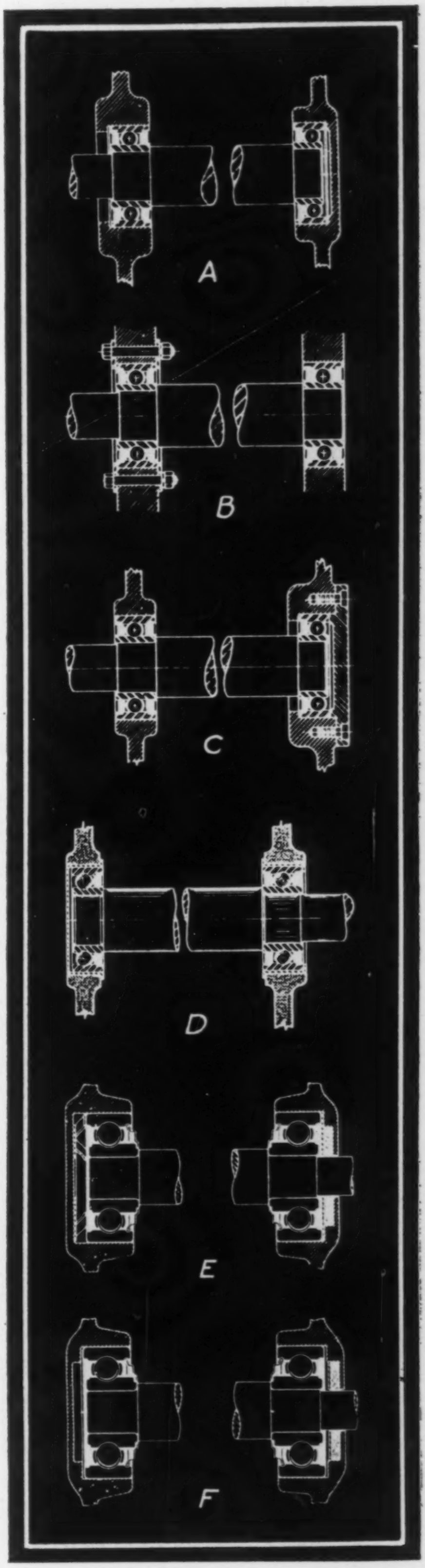


Fig. 3—Bearing seals permit simplified mountings on many types of application

One manufacturer recommends that double sealed bearings should not be used for cam rollers where heavy pressures are involved. The outer ring is not a strong member; it is a wear resisting member that must be supported. If imperfectly supported it must be made heavier and in the case of double rows must be made without holes in order that dust and grit does not enter.

A conventional application with bearings mounted against shaft and housing shoulders is shown in *Fig. 3A*. The housings are merely pockets, the need for extra covers having been eliminated by the bearing seals. In the blind housing only the single seal type bearing is needed, obviously. A certain amount of float is allowed in the case of both bearings to permit minor adjustments of the shaft and eliminate the possibility of cramping.

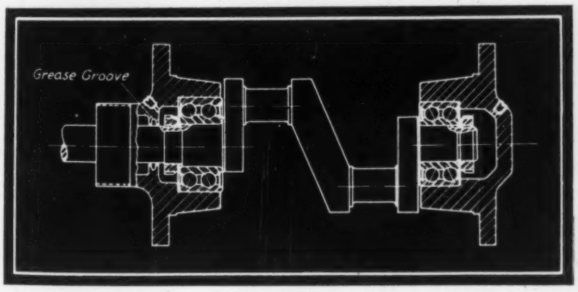


Fig. 4—Plate type bearings can be used where separate lubrication for bearings is maintained

An even simpler arrangement is illustrated in *Fig. 3B*. By using two seal bearings the housings can be bored straight through, no shoulders being necessary on one end, and provided in the other case by steel plates bolted flush against the bearing outer ring and housing. The simplicity of this mounting will appeal to designers where only light loads are to be encountered.

By employing a bolted-on end cap for a closed-end application, *Fig. 3C* the single seal bearing is locked in position between two housing shoulders, enabling the open-end application of the double seal type to be fitted into place with no shoulders in the housing whatsoever. This application is not recommended where thrust is present in both directions, as no lock nut is provided on the shaft, but for light service it is entirely satisfactory if fits are carefully made.

Where bearings must be mounted in an aluminum housing, steel liners may be used to provide an accurate surface against which the bearing outer rings can be mounted. The extra width of the outer ring of the felt sealed bearing, however, minimizes the possibility of peening the housing even when they are mounted in aluminum. It will be observed, *Fig. 3D,* that the pressed steel cups are so formed as to furnish a shoulder in the case of an open end. The closed-end mounting allows 0.020-inch float.

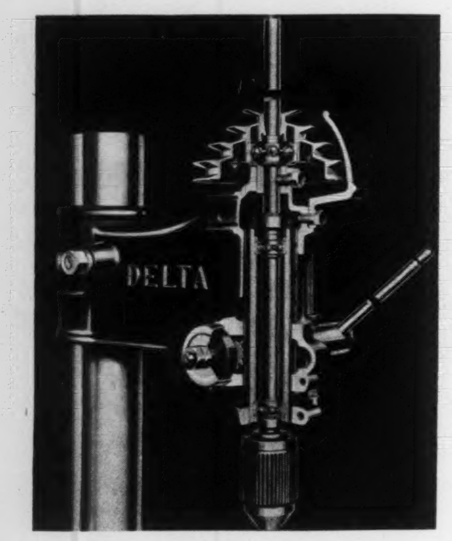


Fig. 5—Horizontal applications, such as this drill press, have successfully employed sealed units

Light Thrust Load Desirable

For small, high-speed motors or other appliances it is desirable to have the bearings operate under a light thrust load so as to assure positive contact of balls and raceways, thus avoiding any possibility of slippage at high speed, *Fig. 3E*. Such a mounting requires the use of only three separate parts in addition to the bearings. These are: A small, unitary steel spring to exert the necessary axial load; a thin metal washer; and a felt ring to complete the closure at the shaft extension end.

Where speeds are slower and a certain amount of axial movement is permissible, as in the armature shafts of standard fractional horsepower motors, bearings may be applied without the loading spring, as shown in *Fig. 3F*. A total clearance between end caps and bearing rings of from 0.015 to 0.020-inch is usually allowed.

Where double shaft extensions are required, the felt and washer arrangement of either *E* or *F, Fig.* 3, is repeated at both ends.

Plate type bearings can be used where separate lubrication for the bearings is maintained, *Fig.* 4. This is especially true for worm reduction units where better results can be obtained if an extreme pressure grease is used for the gears and a cup grease or oil is employed for the bearings. For very slow speeds, such as guide wheels, the bearings can be packed with a grease to suit the operating conditions, *Fig.* 2, and the service given will be quite satisfactory.

Additional Seals Can Be Used

When extremely dirty conditions are encountered, in moderate speed applications, additional seals with the sealed bearings can be used to advantage. By filling in the space between the outer seal and the bearing seal with a correct grade of grease, not only the dirt and foreign matter will be excluded, but the leakage of the bearing lubricant will be prevented.

Although sealed bearings find more applications on horizontal than on vertical shafts, a successful application has been made on a drill press as shown in *Fig.* 5. *Fig.* 1 shows an application in a trolley type conveyor. A conveyor roll mounting is shown in *Fig.* 6.

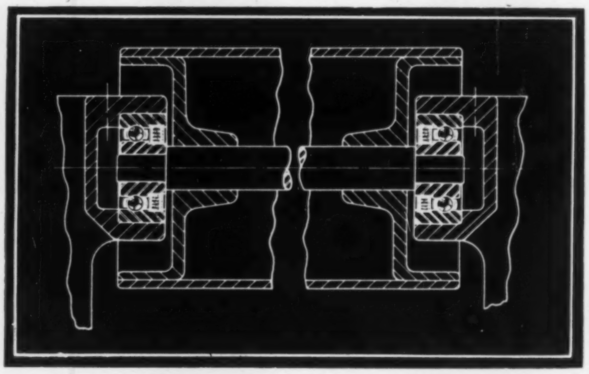


Fig. 6—Conveyor roll mountings, especially those exposed to dirt, frequently incorporate protected bearings

Integral seals used in mine car bearings will prevent the entrance of water as usually encountered, but when the cars operate in very wet mines where they continually pass through water or are left standing in it, the design should provide for an additional seal. The wheels may be made with a cored hole fitted with a grease valve, by means of which water pump grease may be forced in to fill the housing space adjacent to the bearing seal.

For their assistance in the preparation of the article, and for the illustrations used, MACHINE DESIGN wishes to acknowledge the courteous cooperation of Ahlberg Bearing Co., Fafnir Bearing Co., Hoover Steel Ball Co., Marlin-Rockwell Corp., New Departure Mfg. Co., and Norma-Hoffmann Bearings Corp.

Developing the Diesel Engine for Small Power Field

By H. B. Dexter

RECENT developments in the automotive field, in traction and in the air have immensely popularized the diesel engine. Speculation is heard on every hand as to how long it may be until this type of engine will serve the entire small power field. There is no detail of the mechanical structure of the small solid injection diesel that becomes impractically small as did the high pressure compressor piston of the older air injection engine. When this ring packed piston was reduced to the size of a common lead pencil in Dr. Diesel's attempts to build small engines, it became apparent that something new had to be developed.

The limitations of the small diesel in passenger car or light truck sizes are not mechanical. They are associated with far less tangible thermal and thermodynamic properties of small combustion chambers.

Compression Varies With Speed

Because compression varies so much with speed and wall temperature, it is usually stated in terms of the more constant and measurable volume ratio of compression. Assuming that a satisfactory ratio is 15 to 1 the following equations result.

$$(V_c + V_d)/V_c = 15$$

$V_d = 15\,V_c - V_c = 14\,V_c$

V_c = clearance or compressed volume

V_d = piston displacement

This means simply that with a 15 to 1 compression ratio the final volume is 1/14 of the volume swept by the piston.

This volume, V_d, may be expressed thus

$$V_d = D^2 \pi L/4$$

In which D equals the cylinder diameter and L equals stroke

In similar engines L equals KD and to simplify the expressions without detracting from the value of the demonstration a value may be assumed for L as 1.2 D.

Then

$$V_d = (D^2\pi \times 1.2D)/4 = 9.4248\,D^3$$

and

$$V_c = 9.42\,D^3/14 = 0.0673\,D^3$$

If all the air were crowded by the piston into a spherical chamber, for instance, the diameter of the sphere, d, would be developed as in the following:

$$\pi d^3/6 = 0.0673\,D^3$$
$$d^3 = 1.28\,D^3$$
$$d = 0.5\,D$$

This solution makes it evident that the diameter of the spherical combustion chamber in geometrically similar engines is a straight line function of the bore. This is true not only of the spherical combustion chamber but of any figure of three dimensions or of revolution containing the compressed volume $0.0673D^3$. It is true also of volumes holding portions of the air charge at the end of compression such as the annular clearance *a, Fig.* 2, the disk form clearance *b, Fig.* 2, the cylindrical clearance *c, Fig.* 1 and the nearly rectangular clearance *d, Fig.* 2. Thus any volume containing a part of the com-

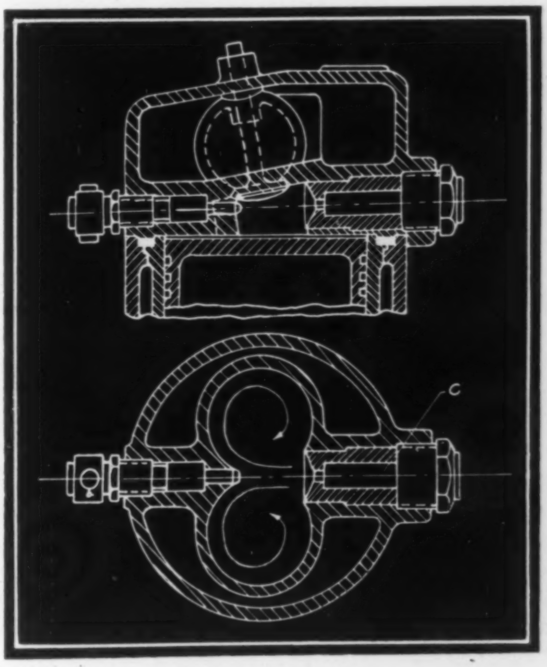


Fig. 1—Cylindrical after-chamber or air cell is a successful type in small bores

pressed air charge at the end of compression should be dimensioned as a straight line function of the bore, and residual volumes making up the total clearance will likewise assume dimensions of the same order.

Size Might Limit Success

Fig. 2 shows a spherical combustion chamber of a type which seems to be assured of success in the small engine field for a number of good reasons, backed by good performance. The question is how small may it be made without sacrificing this success.

As usually developed the sphere assumes a diameter equal to about 0.4 *D* since part of the air is lost to mechanical clearances elsewhere. In large bus or truck sizes of 5 inch bore the sphere is about 0.4 × 5=2 inches diameter. For passenger car and small truck sizes the sphere diameter becomes 0.4 × 3=1.2 inches or 0.4 × 3.25=1.300 inches. Rather a small diameter in which to check a spray entering at a velocity of 500 or more feet per second.

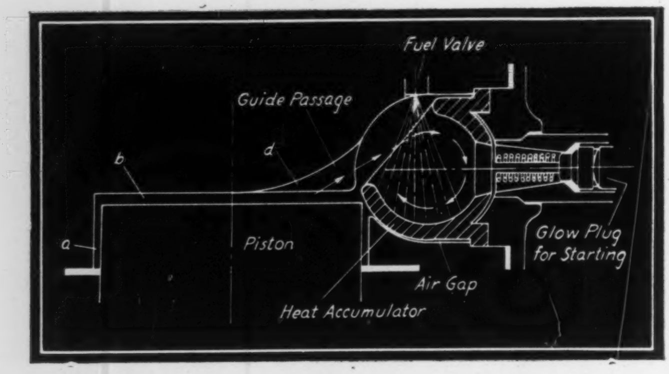


Fig. 2—This type of spherical combustion chamber seems assured of success in small engine field

Successful Types Developed

The cylindrical after chamber or air cell in *Fig.* 1, another successful type in a certain range of bores, takes the diameter 0.2 *D*=1 inch for 5-inch bore engines. For 3-inch bore this becomes 0.2 × 3=0.6 inch.

Not only are these diameters small enough to bring the air charge undesirably close to cooled surface but the ratio of the area of the enveloping surface to the volume contained varies for any of the usual figures inversely as the diameter. A spherical chamber of 1-inch diameter has twice as much surface per unit of volume enclosed as one of two inches diameter. This makes it difficult to attain auto ignition temperatures in small chambers at light loads and causes excessive jacket loss at any load.

No doubt diesel engineers will find means of making the small bore engine successful but a design, perhaps an invention, problem still exists in that field if the diesel is to vie with the gasoline engine.

Articles on this and allied subjects published in previous issues of MACHINE DESIGN include:

"Aircraft Diesel Engine Embodies Striking Design Features," April, 1930, p. 38.

"Controversy Rages—Will the Auto Diesel Prevail?" by Austin M. Wolf, July, 1931, p. 21.

"Use of Roller Chains Is Extended to Camshaft Drives," by Harold F. Shepherd, Aug., 1931, p. 39.

"Simplicity, Compactness Characterize New Two-Stroke Engine," Feb., 1932, p. 25.

"Does Optional Equipment Permit Standardization?" by Harold F. Shepherd, May, 1932, p. 27.

"Diesel Progress Leads to Wider Use," by Max Hofmann, March, 1934, p. 33.

New Books Treat Kinematics and Hydromechanics

Kinematics of Machines

By George L. Guillet; published by John Wiley & Sons Inc., New York; available through MACHINE DESIGN *for $3.00 plus 15 cents postage.*

In the selection of material for this book the author has endeavoured to include such information as is of decided practical importance rather than that which is principally of interest from a theoretical standpoint. Fundamental mathematical analyses of motions in machines and useful graphical constructions pertaining to them have been given the preference over purely descriptive matter.

In this, the third edition, several changes have been made with the object of greater clarity and increased usefulness as a text. Type examples fully worked out have been added in some cases, where experience has indicated their desirability. Some rearrangement of text material has also been made to improve the continuity of subject matter, certain illustrations have been redrawn, and a few additional ones have been added to indicate the operation of recent important mechanical devices.

□ □ □

Fundamentals of Hydro and Aeromechanics

By O. G. Tietjens; published by McGraw-Hill Book Co. Inc., New York; available through MACHINE DESIGN *for $4.00 plus 15 cents postage.*

This book like the one by Timoshenko (M. D., July), is another in the series of engineering societies' monographs. The data are based on the lectures of L. Prandtl to whom Dr. Tietjens formerly was assistant at Kaiser Wilhelm Institute for Flow Research. Briefly, the volume contains the theory of the equilibrium of liquids and gases with practical applications to balloons and airships. It gives a comparatively rigorous treatment of motion of the "ideal" liquid with zero viscosity, and ends with a chapter on viscous fluids.

Proposed Standard Will Clarify Engineering Drawing

THE proposed American standard for drawing and drafting room practice now is before the sectional committee for approval by letter ballot. Following completion of the ballot the standard will go to the sponsor bodies (A. S. M. E. and S. P. E. E.) for approval and then to the American Standards association for final approval and designation as an American standard.

Supplementing a discussion of the project in the April, 1930, issue, there is presented herewith, and pictorially on the succeeding page, some of the other important recommendations. One phase that is likely to arouse considerable interest is the recommendation for finish marks (see illustration *E,* page 28). A surface to be machined or "finished" from unfinished material should be marked with a 60-degree V, the bottom of the V touching the line representing the surface to be machined. To indicate the type of finish required a letter or other symbol should be placed in the angle of the V, except for smooth finish where a V without a letter may be employed.

Recommendations for Dimensions

Dimensions should not be duplicated on various views of a single part, except where they will add to the clarity of the drawing, and no more should be given than those required to reproduce the part. Dimensions up to and including 72 inches preferably are expressed in inches and those greater than this length, in feet and inches. Fractions should be written with their dividing line in line with the dimension line (see *A*). It also is recommended that dimension lines and their corresponding numbers be placed so that they may be read from the bottom or right-hand edges of the drawing. All dimensions should be placed in the direction of the dimension lines, *A,* page 28.

Drawings at *C* show the regular method of representing screw threads recommended for general use on assembly and detail drawings. Except in sections, external and invisible internal threads should be represented by alternate long and short cross lines at right angles to the axis. The simplified method of screw thread representation is shown at *D.* This may be adopted where it is desirable to simplify drafting work. Depth of the thread should be indicated by lines consisting of short dashes parallel to the axis. This simplified method is not recommended for either exterior or sectional views of assembled parts.

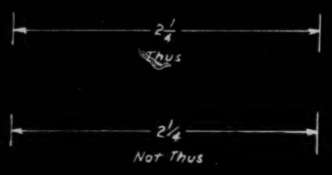
Size and length of thread and depth of tap should be indicated. Threads always are considered to be right hand unless specified as left hand or L H. Bolt heads should be shown as flat and chamfered to the thread depth at 35 degrees with the flat surface.

Regarding curves and angles, the standard sets forth that a curved line may be dimensioned either by radii or offsets. When angular dimensions are necessary a horizontal or vertical centerline should be used as a base line, but not both, and points located from it as indicated at *F.* If holes are to be spaced equally one only should be located and a note added, e.g., "6 Holes Equally Spaced."

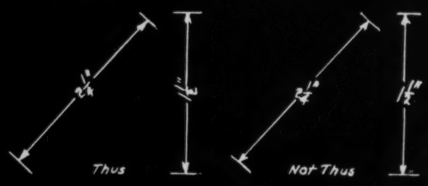
An abbreviation D should follow a dimension indicating the diameter of a circle, except when it is obvious from the drawing that the dimension is a diameter (see *G*). Dimension of a radius always is followed by the abbreviation R. The center should be indicated by a cross or circle and the dimension line should have one arrow head.

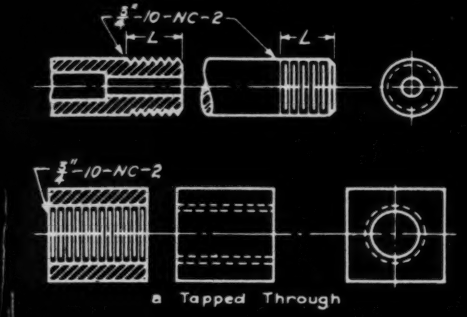
Standard Dispels Confusion

This standard offers genuine assistance to engineering executives under whose jurisdiction the engineering department falls. Standardization of engineering drawing practice will clarify an existing situation among manufacturers that has caused confusion. Those interested in obtaining a copy of the published standard which is expected to be made available some time in the fall, can place advance orders with the A. S. M. E. publication-sales department, 29 West Thirty-ninth street, New York.

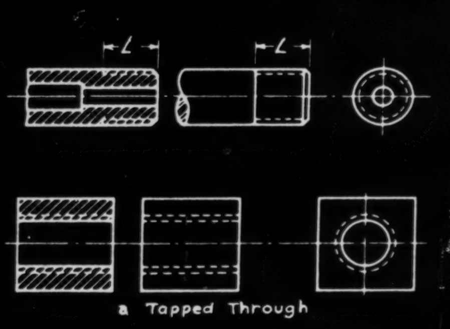

2 1/4
Thus
2 1/4
Not Thus

A — (Left) — Dividing lines of fractions should be in line with dimension lines. B—(Right)—Dimensions should be placed in direction of dimension lines

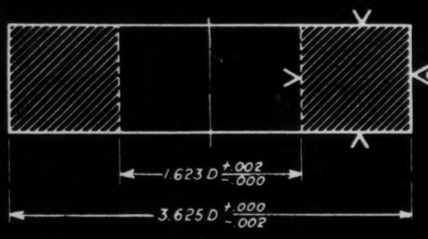

2 1/4"
1 1/2"
Thus
2 1/4"
1 1/2"
Not Thus


3/4"-10-NC-2
L
L
3/4"-10-NC-2
a Tapped Through

C—Regular method of representing screw threads


L
L
a Tapped Through

D—Simplified symbol method of screw thread representation


G
1.623 D +.002 -.000
3.625 D +.000 -.002

$\overset{R}{V}$ rough machine finish

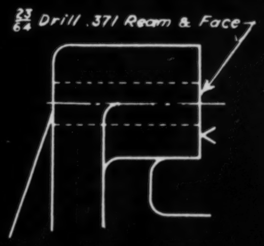
V smooth machine finish

$\overset{RG}{V}$ rough grind

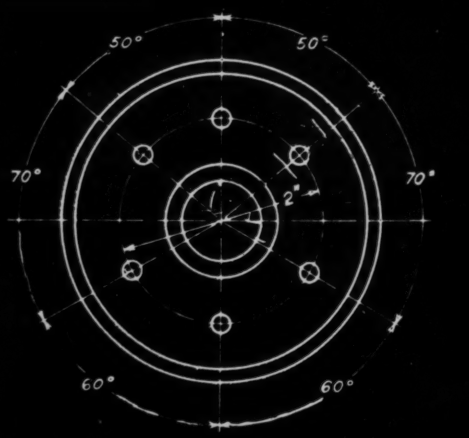
$\overset{G}{V}$ grind

$\overset{P}{V}$ polish

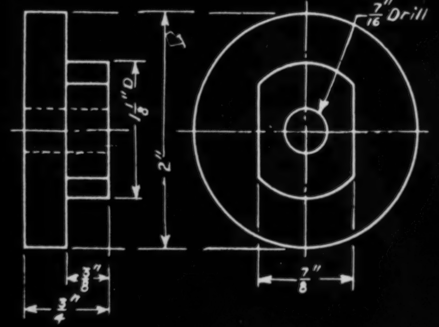
$\overset{F}{V}$ file


23/64 Drill .371 Ream & Face

E—Surface to be machined or "finished" should be marked with a 60-degree V, the bottom of the V touching the surface. A letter placed in angle of V designates type of finish


50°
50°
70°
70°
2"
60°
60°

F—Horizontal or vertical centerline (not both) is used for angular dimensions


7/16" Drill
1 1/4" D
2"
1/4
3/8"
7/8"

G—Dimension indicating diameter of circle is followed by abbreviation D, except when obvious that the dimension is a diameter

Attuning Design to Public's Desires

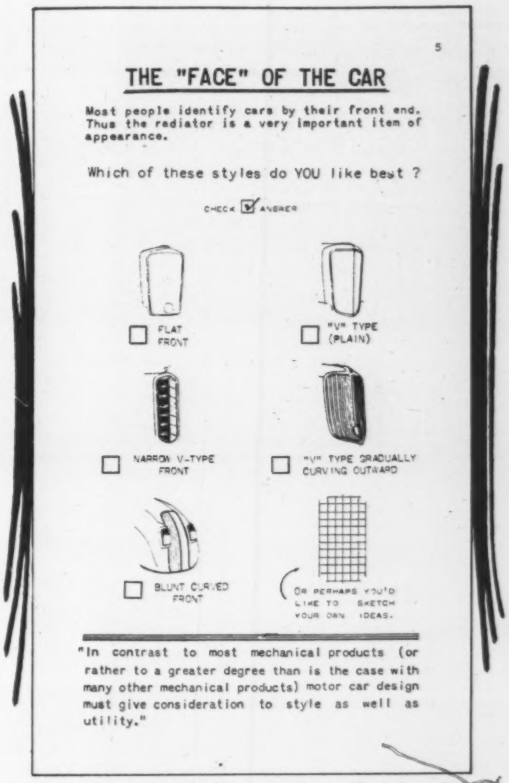
ULTIMATELY the customer dictates the design of a machine; that is if the equipment is to set a successful sales record. The basic conception may have been the property of an individual but in the evolutionary process which every product must undergo, the earmarks of the public's whims and consumer requirements are plainly visible.

Too many manufacturers are not fully awake to these facts. They prefer to follow the course set down by tradition. Or the engineering department may turn a deaf ear to outside suggestions to preserve a sense of false pride. These organizations particularly might do well to catch the spirit of General Motors' plan of research in inviting owners of all makes of cars to pool their practical experience with the technical skill of its designers.

The customer research staff of the Detroit concern recently made the startling announcement that during the past 18 months over 300,000 motorists have responded to its picturized questionnaires dealing with various features of automotive design. The accompanying illustration is a typical page from the 24-page booklet, 1934 edition.

Plan Has Many Possibilities

Often in the past MACHINE DESIGN has called attention to this type of research. Commenting on the G. M. C. plan, an editorial in the Sept., 1933, issue brought out that "few instances of market research compare with this. It is an outstanding example of the present-day need for investigating changing market conditions and trends." The possibilities of this process, although costly, are tremendous. Yet almost without exception it seems to have merit for domestic machinery, office machinery, transportation equipment, etc. Even on some types of industrial equipment where the field is not too highly specialized a survey to determine the wants of the user would be helpful to the engineering department.



5

THE "FACE" OF THE CAR

Most people identify cars by their front end. Thus the radiator is a very important item of appearance.

Which of these styles do YOU like best ?

CHECK ☑ ANSWER

☐ FLAT FRONT

☐ "V" TYPE (PLAIN)

☐ NARROW V-TYPE FRONT

☐ "V" TYPE GRADUALLY CURVING OUTWARD

☐ BLUNT CURVED FRONT

OR PERHAPS YOU'D LIKE TO SKETCH YOUR OWN IDEAS.

"In contrast to most mechanical products (or rather to a greater degree than is the case with many other mechanical products) motor car design must give consideration to style as well as utility."

Answers to questions such as these assist the designer of machinery

In the questionnaire under discussion sixty-five features of motor car construction are covered and the booklet is designed to appeal to those who usually ignore questionnaires—an important point. Of pocket size, it is easy to carry, simple to read, and no writing is necessary unless the reader feels the urge. A check mark in a small square before each question indicates sufficiently what is preferred in mechanical characteristics and mechanisms, finish and operating qualities.

Another point in favor of this procedure is the psychological reaction that readers get when they receive their copy of the questionnaire. To be asked by a company to furnish ideas is a boost to any man's ego. Sheer pride in being able to share the partnership of ideas prompts him to send in his contribution.

The inscription on the inside of the front cover is fitting as an introduction to the questionnaire and as a conclusion to this discussion. It reads: "An Eye to the Future—An Ear to the Ground." This after all is a resolution that all alert engineers must make if they expect to keep pace with progress and a larger sales volume.

With the changes in thinking and buying brought about during the depression, this type of research serves an extremely valuable purpose in bringing the manufacturer—and particularly the engineering department—close to the ultimate purchaser.

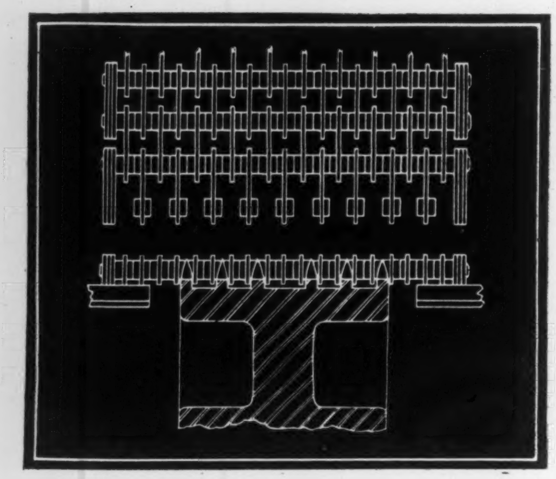


Fig. 1—Sprocket is cut narrower than chain which is supported by steel tracks at sides

Solving Conveying Problems with Steel Chains

By L. E. Jermy

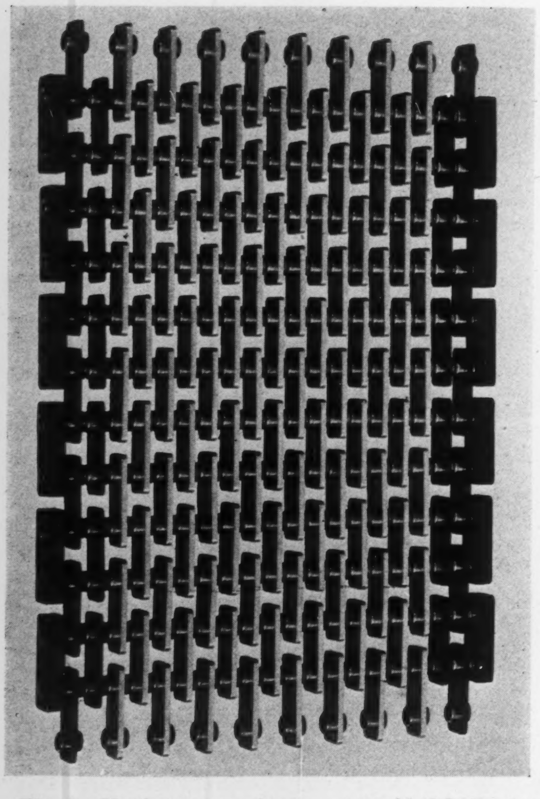


Fig. 2—Maximum openings are provided between links to facilitate cooling of product

BOTTLE and package conveyors now being utilized on machinery for the brewery and allied industries have created a need that is being met admirably by steel conveyor chain. Accuracy of manufacture of this type of chain gives it many advantages over earlier types of conveying chain, though in many cases at somewhat higher initial cost.

One of the principal assets of the steel chain arises from its manufacturing accuracy—the possibility of "matching" long lengths. Such matching is desirable where two chains are to be used, with slats or carriers placed between as on a moving stairway or similar application. It will be seen readily that if every link, pin and bushing of a chain were to have large tolerances it might happen that on long lengths the difference between the two strands would be several inches.

Matching Facilitates Installation

To guard against even minor discrepancies the principle of matching usually is followed, though tolerances on all parts may be close, by the manufacturer; thus assurance can be had that the chains will line up satisfactorily at the start and that a sufficiently close match will be maintained throughout the life of the conveyor.

For applications where a single chain only is used the accuracy of the steel chain also is advantageous. Smoothness of running necessary on some types of conveyors is more readily obtainable, and as these chains in most cases operate on cut rather than cast sprockets, uniform motion is more certain.

Instances occur however, where absolutely constant speed is difficult to attain even with chains and wheels of close workmanship. Under light load and slow speed, where a certain amount of pull is necessary in overcoming working friction, a jerky effect may be set up—particularly where the conveyor is extremely long. This slight jerkiness, instead of subsiding, may become accumulative and continue as long as the conveyor is running. The designer of the apparatus should therefore take every precaution to eliminate the possibilities of frictional resistance in his design and to provide satisfactory means for lubrication. A similar jerky action can be set up by the use of sprockets having too few teeth, reference to which will be made later in the article.

In many cases it is advantageous, instead of using two different strands of chain with attachments between, to utilize a single chain of the multiple strand type as illustrated in *Figs.* 1 and 2. This chain comprises 25 strands. It was designed especially for use in glass plants to convey hot glass jars from mold to lehr. Two features are combined in its construction — maximum openings for controlled or natural ventilation and maximum continuity of smooth supporting surface.

Inner Link Plates May Be Alloy

On this chain there is only one link plate for each link, pressed centrally on two steel bushings. The laminated pin link plates at the ends of the pins and the two outer rows of link plates are of steel to accept the sliding wear on the supporting steel tracks. Link plates in the central portion may be of steel, aluminum alloy or phosphor bronze. The latter two materials offer maximum resistance to "checking" of the bottom of the hot glass ware, and may be used without shortening the life of the chain as the link plates do not carry the load against the sprocket teeth. The steel bushings not only accept all of the wear against the teeth but they act also as spacers.

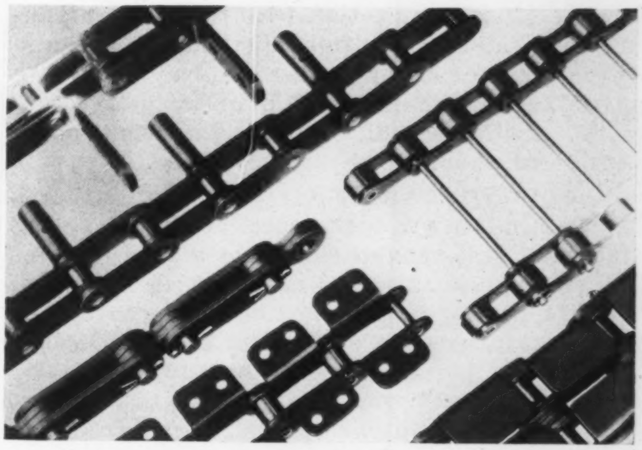


Fig. 3—Standard parts can often be utilized for building up conveyor chain

Fig. 3 illustrates a number of typical conveyor chains built from standard roller chain parts, and standard and special attachments. These are indicative of the countless variations that can be assembled with the attachments riveted, welded or bent to suit the particular application. Employment of the standard roller chain construction and the extended pitch principle on some of the more recent steel conveyor chains has made available a type of chain that is not only accurate but economically attractive from the standpoint of efficient operation and long life.

Ordinarily, lubrication of chains of this type is not a serious matter excepting in those cases in which the conveyor may be extremely long and friction especially harmful (as cited in the foregoing) or where the chain operates through an oven, furnace or similar class of equipment where conditions are severe. In these cases special means of lubrication should be provided, pre-

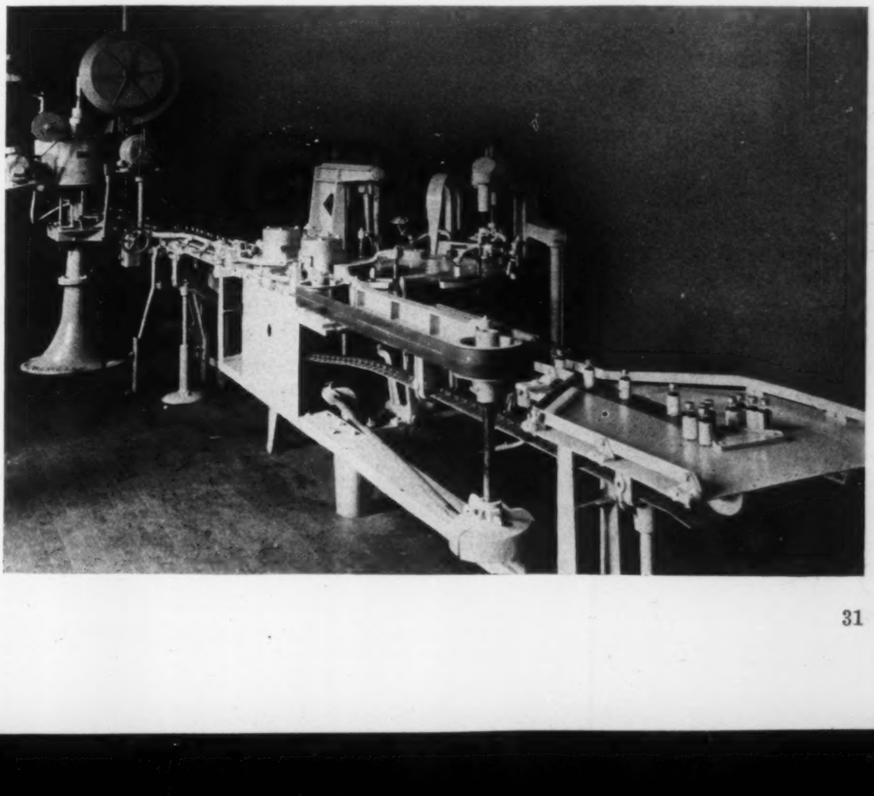


Fig. 4—Installation of platform conveyor on labeling machine shows single strand chain with attachment plates

ferably after consultation with the chain manufacturers and lubrication companies. Often a special type of oil or grease can be specified to advantage on an instruction plate on the machine, the benefit of ordinary lubricant being negligible under these circumstances.

One of the more simple types of installation is depicted in *Fig.* 4, a bottle conveyor on a labeling machine. This type of chain has a bent-over attachment plate at each link to which is welded the flat platform top plate. These continuous platforms are especially useful on applications such as this, permitting a steady flow of containers to be passed from one operation to the next.

As mentioned in the article on chain driving published on pages 36 to 38 of the June issue it is not desirable, unless by force of circumstances, to use sprockets having small numbers of teeth. This is less important on conveyor chain applications than for driving chains, the speeds being considerably slower. Fortunately so, because conditions often militate against the use of sprockets having large numbers of teeth on conveyor applications, particularly where long-pitch chains are used, on account of restrictions in diameter of the sprockets. Such limitations may make it obligatory to use sprockets having small numbers of teeth, and for the general run of machines such sprockets are satisfactory. Owing to the polygonal effect they have, however, in influencing the linear speed of the chain, the slight nonuniform motion resulting may be a disadvantage in rare cases, and either more space must be provided for the sprockets or shorter pitch chain used.

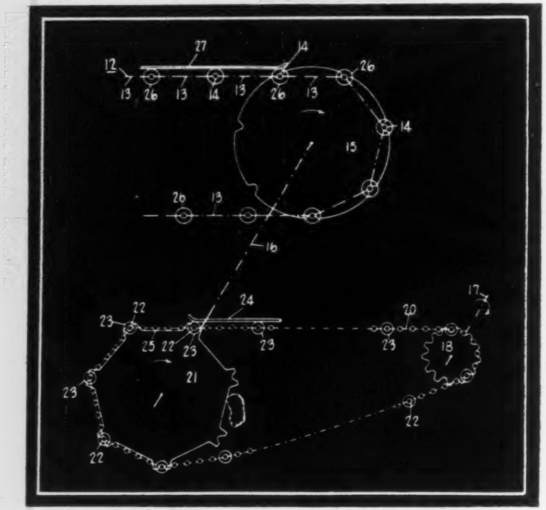


Fig. 5—*Patented device for maintaining uniform motion of long-pitch chain*

At attempt has been made in a device, *Fig.* 5, recently granted a United States patent, to overcome this difficulty where a constant linear speed is essential with a long-pitch chain and where it is possible only to use a sprocket having relatively few teeth. The idea, as depicted in the drawing, involves the employment of a short pitch driving chain 20 and a sprocket 21 cut to engage this driving chain at intervals of five teeth. The pinion on the driving shaft 17 is cut in the conventional way, and because the chain pitch is short and a reasonably large number of teeth are permissible, the linear speed of the driving chain is practically constant.

Guide Rollers Are Provided

Sprocket wheel 21 is provided with the same number of teeth as the conveyor chain sprocket 15, five pitches of the driving chain being equal in length to one pitch of the conveying chain. The driving chain, between engaging bushings, lies along the pitch chords of its sprocket. At each engaging bushing is a pair of rollers 23 overhanging the chain, each being of a diameter somewhat larger than the chain bushings.

Near to the point of disengagement of chain 20 from sprocket wheel 21 is a track 24 for the rollers. This track is mounted in such a relation with chain 20 that it causes each chain bushing 22, after it has disengaged from the sprocket, to move in the direction it was moving at the instant of disengagement—even though the next successive chain bushing 22 subsequently rises considerably above the horizontal line passing through the centers of the other bushings.

Chain 12 is provided with rollers at each bushing and also with a track, 27. Consequently a similar action takes place on engagement of chain 12 as on the disengagement of chain 20 just described. As a result, long pitch chain 12 engages sprocket wheel 15 at any instant at the same angle relative to a pitch chord as that which the disengaging short link chain 20 makes with the corresponding pitch chord of sprocket 21. The variations created in angular speed of shaft 16 therefore are compensated for and virtual constant linear speed of chain 12 results.

Accuracy Aids Operation

It should not be inferred, on account of this description of a compensating device that difficulty is often experienced from varying linear speed. The foregoing is given simply to indicate the possibility of overcoming it in the cases where constant speed is absolutely essential. In most cases the slight variation is negligible. Particularly with the steel chains discussed in the foregoing, refinement of manufacture results in smoothly-operating, efficient systems.

The assistance of the following companies in furnishing application data and illustrations is gratefully acknowledged: Baldwin-Duckworth Chain Corp., Diamond Chain & Mfg. Co., and The Whitney Mfg. Co.

A list of previous articles on this and allied subjects was published at the end of the chain article in June issue, page 38.

New Machines Indicate Design Trends

REDESIGN of machinery to take advantage of hydraulic means of operation represents the outstanding trend in design during the last few months. This trend, however, is not as recent as it may appear, as many manufacturers have been perfecting their plans to this end for a number of years. More designs of this type can be expected in the near future.

The pictorial presentation of "Design Features in New Machines," included on the following two pages, shows definitely what manufacturers are adopting in order to improve design and widen their markets. Trends that have stood out in past months, in addition to hydraulic designs, are the even more wide-spread use of antifriction bearings, increased application of welding, designs which simplify operation and incorporate all auxiliary mechanisms into a single unit, and the use of variable speed devices.

As it is obviously impossible to include all machines announced within a month in the double page layout, MACHINE DESIGN will include each month a listing of machinery recently developed. Machines announced during the past month include the following, classified by their fields of application:

Air Conditioning

Unit Conditioner,
Bon-Air Radiator Corp.,
Boston.

Unit Conditioner,
Frigidaire Corp.,
Dayton, O.

Agricultural

Power Mower,
Toro Mfg. Co.,
Minneapolis.

Brewing

Automatic Barrel Washer,
Ideal Automatic Machine Co.,
Cleveland.

Oil Burner Pitching Machine,
Harnischfeger Corp.,
Milwaukee.

Steam Operated Cooler,
Elliott Co.,
Pittsburgh.

Filler and Crowner,
Bishop & Babcock Mfg. Co.,
Cleveland.

Bakery

High Speed Dough Brake,
Champion Machinery Co.,
Joliet, Ill.

Construction

Tractor,
Linn Mfg. Corp.,
Morris, N. Y.

Gas-Electric Road Finisher,
Blaw-Knox Co.,
Pittsburgh.

Cement Weighing Feeder,
Fuller Co.,
Castasauqua, Pa.

Domestic

Refrigerator,
Frigidaire Corp.,
Dayton, O.

Vacuum Cleaner,
Thos. A. Edison, Inc.,
West Orange, N. J.

Oil Burner,
Norge Corp.,
Detroit.

Washing Machine,
Westinghouse Electric & Mfg. Co.,
Mansfield, O.

Rug Shampooing Machine,
Hild Floor Machine Co.,
Chicago.

Washing Machine,
Audiola Radio Co.,
Chicago.

Dry Cleaning

Synthetic Solvent Cleaning Machine,
Butler Mfg. Co.,
Kansas City, Mo.

Electrical Machinery

Battery Charger,
Century Electric Co.,
St. Louis.

Foundry

Tumbling Mill,
W. W. Sly Mfg. Co.,
Cleveland.

Molding Machine,
Osborn Mfg. Co.,
Cleveland.

Materials Handling

Pump for Transporting Pulverizing Materials,
Fuller Co.,
Castasauqua, Pa.

Metalworking

Multiple Head Drilling Machine,
Barnes Drill Co.,
Rockford, Ill.

Rod Forming Press,
Williams, White & Co.,
Moline, Ill.

Electric Tools,
Chicago Pneumatic Tool Co.,
New York.

Crank Pin Grinder,
Landis Tool Co.,
Waynesboro, Pa.

Spiral Bevel Gear Grinder,
Gleason Works,
Rochester, N. Y.

Sheet Stretcher,
Lewis Foundry & Machine Co.,
Pittsburgh.

Office

Electric Typewriter,
International Business Machines Corp.,
New York

Painting

Spray Gun,
H. D. B. Corp.,
Chicago.

Plant

Industrial Vacuum Cleaner,
Breuer Electric Mfg. Co.,
Chicago.

Plastics

Molding Press,
Hydraulic Press Mfg. Co.,
Mt. Gilead, O.

Power Plant

Mechanical Coal Cleaner,
Jeffrey Mfg. Co.,
Columbus, O.

Textile

Sizing Machine, for Rayon,
Van Vlaanderen Machine Co.,
Paterson, N. J.

Spring Needle Machine,
Wildman Mfg. Co.,
Norristown, Pa.

Transportation

City Bus,
General Motors Truck Co.,
Pontiac, Mich.

Subway Cars,
Edw. G Budd Mfg. Co.,
Philadelphia.

Parlor Type Bus,
Twin-Coach Corp.,
Kent, O.

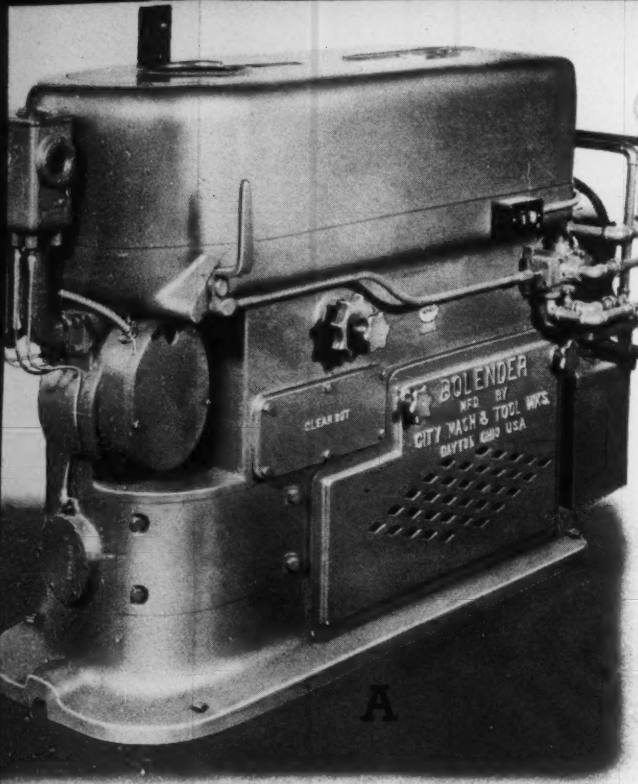
Welding

Gas Engine Driven Welder,
Lincoln Electric Co.,
Cleveland.

Seam Welder,
Taylor-Winfield Corp.,
Warren, O.

Woodworking

Portable Electric Drill,
Black & Decker Mfg. Co.,
Towson, Md.



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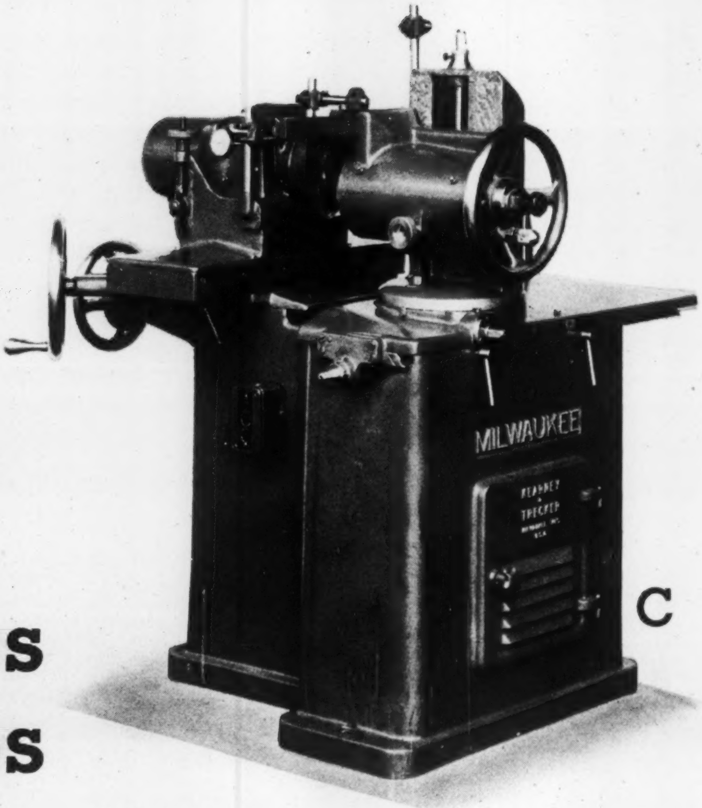
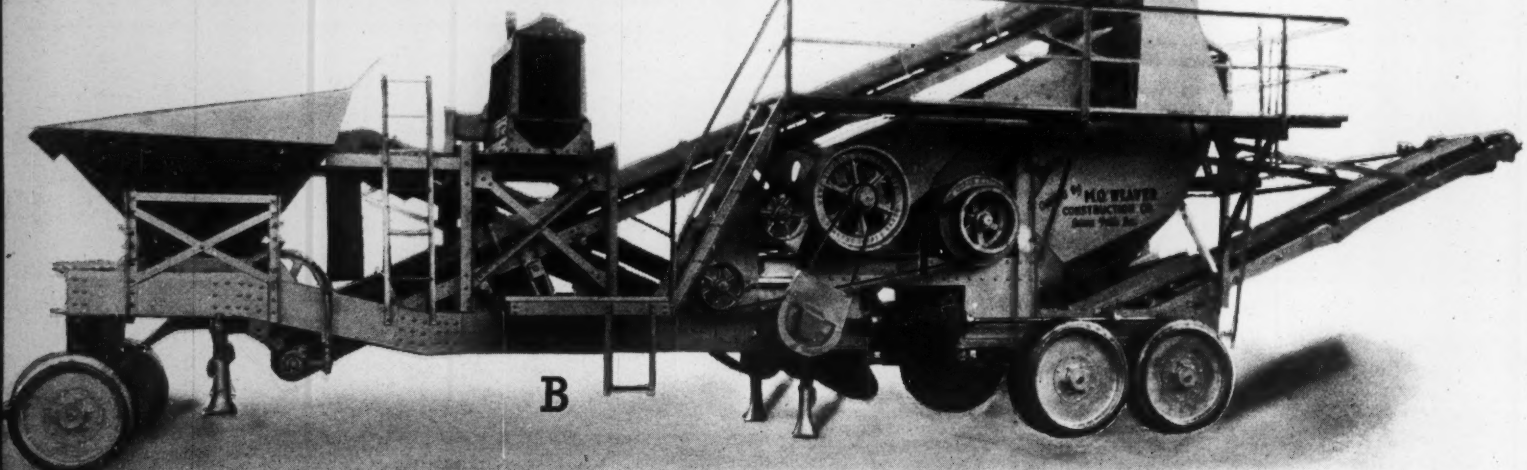


C

Design Features in New Machines

A Pictorial Presentation of Recent Machinery from the Standpoint of Design.



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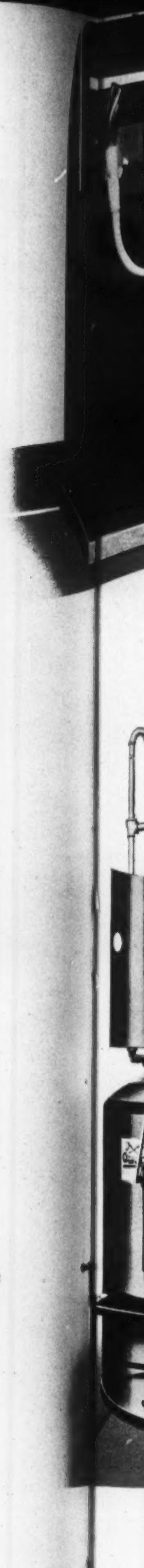


(A) All master burnishers on the gear burnisher of The Cimatool Co. are roller bearing mounted. The machine motor is enclosed in the base. Another motor, for lubricant and coolant systems, is mounted at the rear. Hydraulic pressure is employed. A single push button starts the machine which then runs automatically.

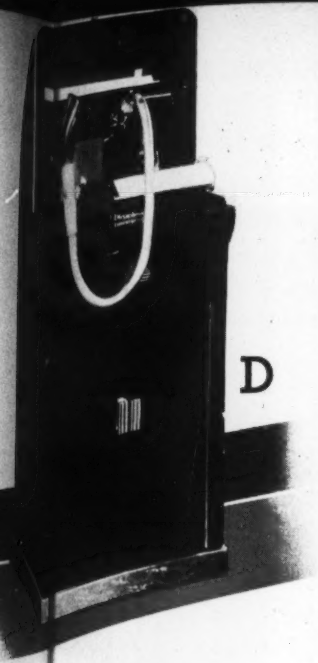
(B) Steel shapes riveted together make up the Iowa Mfg. Co. straight line gravel and rock plant which is a completely self-contained unit. Composition conveyor belts carry the material. Power from the gasoline engine is transmitted to the working parts through chain drives and flat belts. Entire flow of material is in a straight line.

(C) Grinding wheel spindle of Kearney & Trecker face mill grinder is carried by three roller bearings with the flywheel solidly mounted between the front and center bearings. Spindle brake, consisting of a lined shoe which contacts the flywheel, is provided so that the operator can quickly stop the spindle after turning off the motor. An exhaust fan driven by a separate motor is fully enclosed in the base of the machine with flexible hose connecting it to the wheel hood.

(D) Careful design from the appearance standpoint marks the new machine of Dictaphone Corp. A universal motor located in the base starts automatically as soon as the speaking tube is raised from its cradle and stops when it is replaced. When the
cabinet is opened, the cu ent is
machine slides into positi auto

(E) A separate relief val with
vent line is provided r the
and two other relief valves th a co
line are provided for the enerat
acetylene generating equi ent of
Co. To insure a gas-tight seal, a
provided on the hopper ou et.

(F) Tank of new mixer of op
welded construction ned wi
glass enamel. Frame of odern
epicyclic agitator drive, tator,



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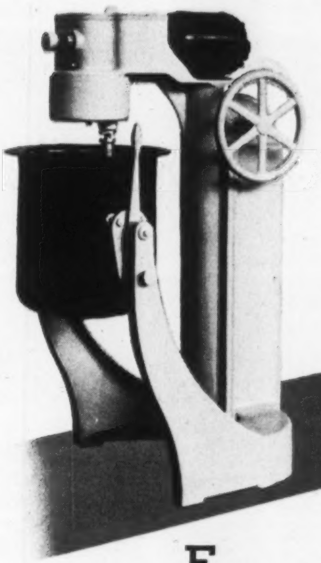

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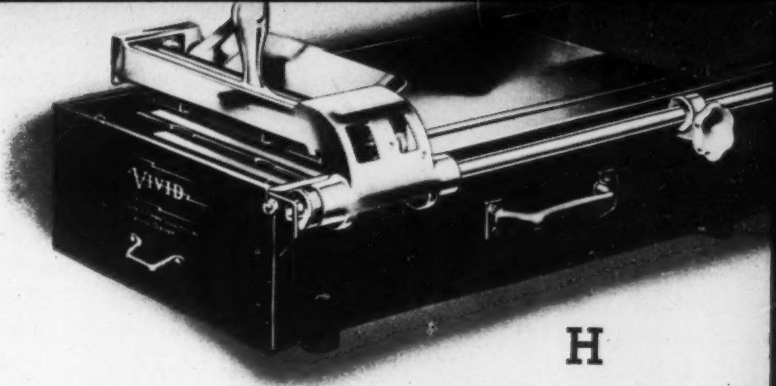

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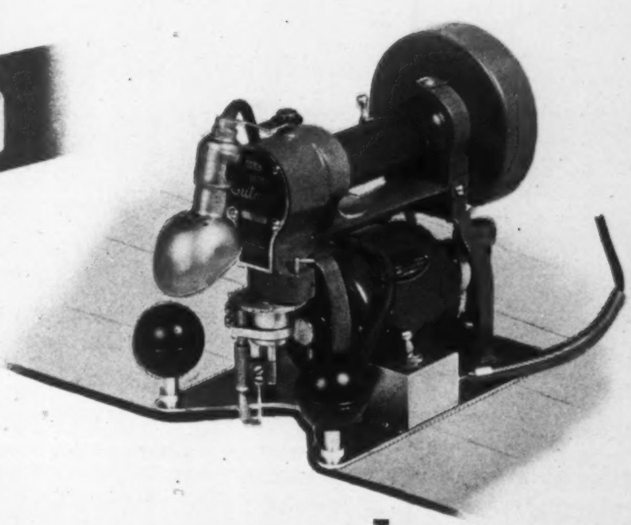

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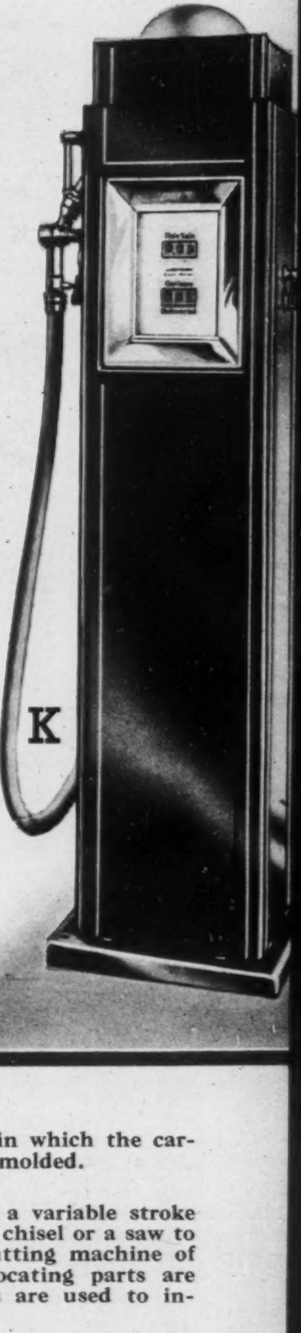

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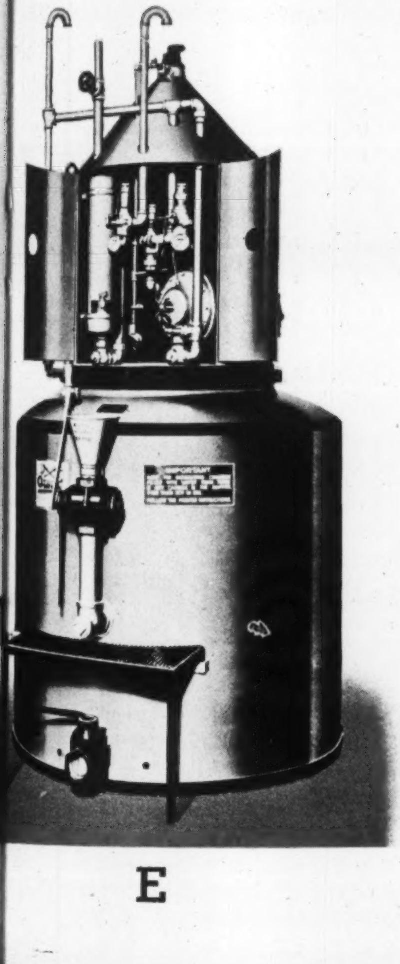

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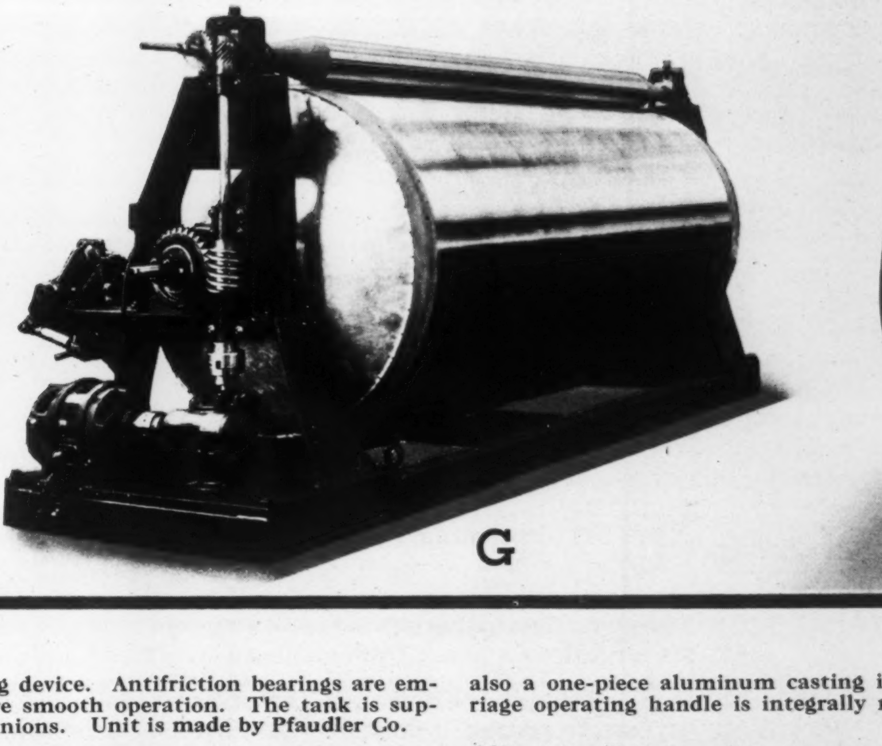


G

the c ent is turned on and the
positi automatically.

ief val with a separate outdoor
ovided or the back-pressure valve,
valves th a common outdoor vent
or the enerator chamber in the
equip ent of Linde Air Products
s-tigh seal, a soft rubber seat is
per ou et.

mixer of open-hearth steel, all-
ction, ned with acid-resisting blue
ne of odern design supports an
ive, tator, lifting mechanism,

tank and tilting device. Antifriction bearings are employed to insure smooth operation. The tank is supported on trunnions. Unit is made by Pfaudler Co.

(G) Arc welded stainless steel, and aluminum are employed in the construction of this rotary steam dryer which will withstand 100 pounds working pressure. This dryer, for the food industry, was built by Struthers Wells Co.

(H) All steel welded construction for the frame of the duplicating machine of L. C. Smith & Corona Typewriters Inc. was adopted to insure strength and durability. Carriage is a one-piece aluminum casting which includes the paper table. The handle arm is also a one-piece aluminum casting in which the carriage operating handle is integrally molded.

(J) A small universal motor runs a variable stroke plunger to which is attached a chisel or a saw to obtain the cutting action in the cutting machine of International Register Co. Reciprocating parts are counterbalanced while ball bearings are used to increase cutting speed.

(K) Motor and electrical fittings of the explosion-resisting type are used in Gilbert & Barker Mfg. Co. gasoline pump which computes the amount of each sale. A thermal switch protects the motor from damage due to electrical overload.

MACHINE
DESIGN

Cannot Hazards to Life Be Combated by Improved Machinery?

FAILURE of the stratosphere balloon to complete successfully the flight started recently at Rapid City, S. D. brings into prominence the idea that has been indicated many times in MACHINE DESIGN—the desirability of the machine supplementing the work of man, particularly in cases where life or health are endangered.

Had it not been that the opportunity arrived on this flight for the use of parachutes, three lives would have been irretrievably lost. Does it not seem possible that with the aid of mechanical and electrical devices, equipment can be developed that would—in the manner of a "robot"—make such flights and return to the earth after reaching a predetermined height with most, if not all, the desired observations dutifully recorded on instruments? Robot ships and robot pilots for airplanes have been developed; it does not therefore seem too big a stretch of the imagination to forecast the robot balloon.

Such developments cannot but assuage the criticisms of those who are intolerant of the machine age. Admittedly the machine has brought its hazards, but progress has been measurable directly with the advancement in machinery. It still remains for the designer to step even farther ahead and eliminate the possibility of dangers incident to machine operation, as he already has done to a large extent on steel mill equipment, foundry machinery and silica grinding machines.

The field is still wide open—if management and the engineer can be influenced to regard the subject from the humanitarian rather than the strictly technical aspect.

• • •

Minimizing Drafting Confusion

DUE to the difference in drawing systems employed by many of the larger companies, time often is wasted by a new man starting in the engineering department in familiarizing himself with the regulations set up. Time also is wasted in the department and in the shop if these regulations are not followed both by new and old employes.

Recognizing this an attempt has been made extending over many years to establish definite standards for drafting. As a result, a proposed standard was published recently. Some of the items included are covered on pages 27 and 28.

When this standard has been finally approved there should be no question as to its being adopted. A uniform system of drawing used over the country would be of immeasurable value.

PROFESSIONAL VIEWPOINTS

Machine Design Welcomes Letters Suitable for Publication

Can Pitting Be Explained?

To the Editor:

REFERRING to the excellent work by W. P. Schmitter published in the June and July issues of MACHINE DESIGN, I wish to make a suggestion for research to clear up the reasons for "pitting".

A number of years ago a speed reducer came to grief on a cement kiln drive, showing severe pitting after a comparatively short term of operation. The reducer was of ample capacity, correct operating instructions were given by the builder, and the user claimed that they were conscientiously followed. Previous to this incident I had observed a case of extremely severe pitting on a number of teeth of a low speed gear of a marine turbine installation, where obviously torsional vibrations, stimulated by the propeller, were responsible for the trouble. In this case some of the holes in the teeth were more than one inch long, nearly one-half inch wide, and more than one-quarter inch deep.

The kiln drive was also suspected of being in a critical torsional condition and torsiograms were taken with a Geiger Torsiograph. These demonstrated that the drive was perfectly smooth.

Thus another reason for the trouble had to be found. When calculating the contact pressures, I felt that a wrong lubricating oil must have been used. This was afterwards found to be true. Correct lubrication remedied the trouble completely.

At the same time I came to the conclusion that the pitting was due to the hydraulic action of the lubricant which is forced under the heavy tooth pressure into small surface scratches. Acting on their sides, the lubricant could produce very considerable side thrusts. These would increase the more the fissure deepened under the hydraulic pressure. Thus, first small parts could be forced out of the surface, then larger flakes could splinter off the open sides.

This seemed to be the only explanation for the deep holes found in the marine gear teeth. In such cases, large broken-out pieces have never been found, only small flakes, as far as I know.

Accepting my explanation as correct, the reason for this experience is obvious: The hydraulic pressure is nil in the hole, but may reach quite high values on the adjacent metal. Thus, thin sheets are splintered off, the fluid pressure entering wedgelike.

I offer this explanation for consideration, discussion and experimentation.

—OTTO A. BANNER,
John Waldron Corp.

To the Editor:

THE discussions of the cause of pitting of gear teeth contained in the articles by W. P. Schmitter in the June and July issues of MACHINE DESIGN, and the discussion of these statements by Ira Short in the July issue lead me to offer a suggestion regarding this action.

Pitting is made possible by motion, and the extent of pitting by ratio, load, rate of speed, material, design, mounting, accuracy and the difference in surface feet per minute between the contacting tooth surfaces.

The pitch circumference of driving and driven gears run at the same surface feet per minute, but the outside circumference of the driving gear develops more surface feet per minute than at its own pitch circumference and the root circumference of the driven gear develops less surface feet than at its own pitch circumference. Consequently, the addendum of the driving gear has the advantageous characteristics of excess acceleration to keep the driven gear in motion, and while the addendum of the driver has different (greater) surface feet per minute than

WE want the readers of MACHINE DESIGN to feel that this section devoted to "Professional Viewpoints" is their section. This is the ideal place for you to say what's on your mind. We are always pleased to receive pertinent thoughts from machine designers, comments on our articles, suggestions for design department practice, and interesting mechanisms and design kinks that may be of value to other designers.—THE EDITORS.

the dedendum of the driven, this is favorable for the driver, notwithstanding that the different surface feet per minute produces stress or pressure, friction, wear and noise.

On the other hand, the root circumference of driving gear develops less surface feet per minute than its own pitch circumference and the outside circumference of the driven gear greater surface speed. This condition is unfavorable for the driver, since it has no advantage of excess acceleration over the driven. Thus, excessive pressure or stress, noise, friction and wear develop.

These conditions have the effect of crushing, kneading and disintegrating the tooth surface and the flow of this action is outward toward the pitch diameter of the driven, and inward, away from the pitch diameter of the driver, causing pitting. Pitting develops inside the pitch diameter, on the driving side of the tooth, on driven and driver gears.

According to the ratio and design, pitting is nearer to or further from the pitch diameter. At the pitch line rolling action exists. If the outside diameter of the driven gear were no greater than its pitch diameter or very little greater, its surface feet would practically be as at the pitch diameter and if the outside diameter of the driving gear were increased within the limits of the ratio, that would be advantageous. If the number of teeth in contact all of the time were two, that also would be an advantage.

The advantage of the greater surface feet of the driving gear addendum, is partially nullified, because the greater radius of the outside diameter of said gear has less effective leverage, and the disadvantage of the lesser surface feet of the driving gear dedendum, is partially improved, because the lesser radius of the root diameter of said gear has more effective leverage.

I have extracted the foregoing from an article entitled "Ideas for Quality Gears" prepared some time ago for a booklet which is to be distributed by my company.

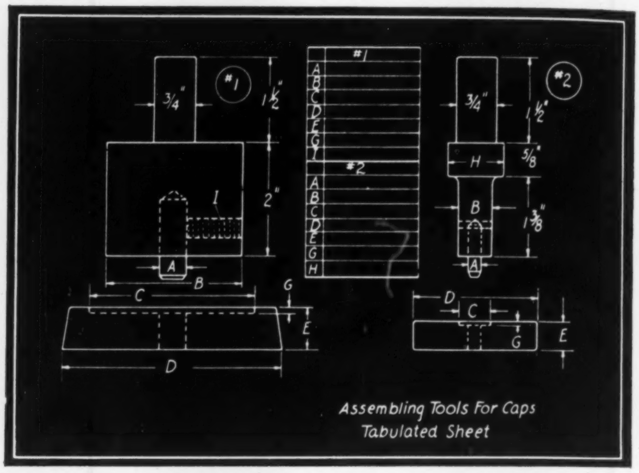
—S. A. Smith,
Meisel Press Mfg. Co.

Tabulated Drawings Conserve Time

To the Editor:

On many jobs time and money can be saved by using tabulated drawings instead of making drawings for each job as it presents itself. A case in point is small assembly tools for sheet metal parts. These are made in a great variety of sizes, and to make a drawing of each size with its small difference in some dimensions would cost a good deal. A tabulated drawing as shown, however, solves the question as to what the tool looks like and its dimensions, and may be used for a great variety of sizes.

In use, blueprints are made from the tabulated drawing to cover the number of sizes of tools for a given job, then from a drawing of the parts for which the tool is made all essential dimensions are filled in in the tabulation space with a light colored pencil. In the accompanying drawing two parts are shown for doing the same job, No. 1 for all large pieces up to given size and No. 2 for smaller tools.



Tabulated drawings lower costs by reducing time necessary for tedious detailing operations

—William C. Betz,
Fafnir Bearing Co.

Gear Article Is Timely

Comments on the articles on gearing which appeared in the June and July issues of Machine Design include the following:

"The article on 'Determining Capacity of Helical and Herringbone Gearing' in your June and July numbers is outstanding and I wish to congratulate you on having such a contribution . . ." —Forrest E. Cardullo.

"We wish to congratulate you on your June, 1934, issue and the article that appears on gearing. We consider this issue one of the finest contributions to industry that has ever come to our notice. . . ."—J. D. Christian.

"We think the article 'Determining Capacity of Helical and Herringbone Gearing' by W. P. Schmitter, in the June issue of Machine Design, is emphatically valuable and impressive . . ."—S. A. Smith.

"Your gear article is timely. Have some pitted gears under survey now and am taking the article to the plant in support . . ."—H. B. Dexter

TOPICS

AT THE 1934 World's Fair the United States patent office in its exhibit in the government building, surveys the American record of inventiveness. Since the organization of our federal government 1,897,932 patents have been issued up to Jan. 1, 1934. Nearest to this record is France with 871,532. Great Britain has 797,153, Germany 583,728 and Italy 273,598. Canada rates high in inventiveness in proportion to population, with a total of 325,800 patents issued. Japan since its modernization has issued 83,361 patents and the U. S. S. R. has granted 63,992.

Among the states last year, New York led with 8017 patents issued. Illinois was next with 4923. Ohio and Pennsylvania almost tied for third honors with 3880 and 3876 respectively. The north temperate zone seems most favorable to the labors of inventors as Mississippi is on the list with 49 patents for the year while Louisiana and Georgia have 141 each.

* * *

Entrance of several large companies into manufacture of domestic and industrial oil burners is evidence of the expanding potentialities of this field. One large oil burner manufacturer predicts an increase of fifty per cent in his business this year, compared with 1933.

* * *

Black and Galatea orange have been adopted by the bureau of air commerce of the department of commerce as colors to be used on official airplanes. They were selected because they are more easily discerned at a distance.

* * *

The month's activity among inventors includes a patent issued on July 3 to Barrett R. Wellington, Troy, N. Y., attorney, for a calculating device which is claimed to solve complicated problems in algebra, trigonometry and arithmetic much more quickly and easily than a trained mathematician. It is a reasonably simple mechanical apparatus based on geometric principles and, according to Mr. Wellington, one, two or three settings of the parts present the solution to any one of numerous complicated formulae involving multiplication, division, addition, subtraction, powers and roots. No. 1,965,062 identifies the patent granted the device.

* * *

Into the news again comes the name of Dr. Georges Claude, prominent French physicist. He is preparing equipment with which he plans to make ice at sea by using power from the ocean. He told the French Academic des Sciences recently that his method, which he did not describe, would produce ice at one-fifth the price a land refrigerating company must charge. So he is transforming the 10,000-ton French steamer TUNISIE into a floating power plant of 1800 kilowatts for the venture.

* * *

Here is an indicative item. Despite the depression the American Standards association has reached an all-time peak in membership, with 42 member-bodies and associate members, and 1233 company members. The organization was formed in 1918 by five technical societies which felt the need of developing inter-industry standards out of their own technical standards.

* * *

Much has been said about air conditioning as the key to advanced industrial prosperity. Here is another aspect of this development that indicates future progress. W. R. Gregg, Chief, United States weather bureau, says the development of air conditioning will remake the economic map of the world. Climate, he asserts, undoubtedly has determined where the cities and centers of our highest culture and civilization have located. The energetic, hard hitting tactics of the northerner who works hard and plays hard because the climate in which he lives inspires and invigorates him to greater activity, has had much to do with the development of giant industries and other activities in our northern states. These in turn, have brought about a centralization of buying power, Mr. Gregg declared.

* * *

In the aeronautical news recently came an announcement that the Rotor Plane Co., New York, has developed a rotor ship of radical design. A two-place, all-metal, high-wing monoplane, it will embody a rotor in the leading edge of the wing. This and a propeller mounted in the pusher position will be driven by a liquid-cooled sixty-five horsepower engine. In flight the metal cylinder or rotor will whirl at 7000 revolutions a minute while air is directed upon it. This air bath, it is claimed, will hug the rotor and the upper wing surface. Instead therefore of a upward, backward pull which is said to be effected on the ordinary plane and which is overcome only by the pull of a powerful motor, the rotor plane will have an upward, forward pull. The new plane's engineers are two Russians, Alexander Chessin and Serge Trey.

* * *

An agreement strengthening international regulations for protection of trademarks, patents and copyrights was signed in London recently by delegates from thirty-nine nations including the United States, according to an *Associated Press* dispatch. Conway P. Coe, U. S. patent commissioner and chairman of the American delegates, said the more stringent regulations now set up would do much to end "commercial piracy" and illegal use of patented products and copyrighted material.

* * *

Unveiled recently at Merthyr Tydfil, Wales, was a memorial to Richard Trevithick. The stone tablet bears the following inscription: "Richard Trevithick (1771-1833). Pioneer of high pressure steam. Built the first steam locotive to run on rails on Feb. 21, 1804. It traversed the spot on which this monument stands on its way to Abercynon." Trevithick's high pressure, noncondensing steam engine was a rival to the low pressure steam engine of James Watt. He invented a number of valuable devices, but died penniless.

* * *

This should be encouraging to engineers who are working on aircraft developments that will adapt planes for higher altitude flying. According to S. J. Zand, research engineer, Sperry Gyroscope Co., the noise level in airplane cabins falls at higher altitudes, a climb of 20,000 feet above ground effecting an improvement in sound level by as much as 13 decibels.

* * *

Announcement recently was made by Secretary of Commerce Roper that the name "National Bureau of Standards" will henceforth be used as the official designation of that bureau. Use of the shorter title "Bureau of Standards" has resulted in considerable confusion, inasmuch as many of the state and municipal governments and several private organizations have in recent years established bureaus of standards.

* * *

More evidence now is at hand to indicate that air conditioning equipment manufacturers apparently are confident that general use of their machines for residence cooling is definitely about to crystallize, since railroads and managers of public buildings have been busily installing them. At the Washington patent office it is estimated that something like 3000 patents have been issued for air conditioning devices, the number having gained steadily in each of the last four years of depression.

Temperature control, humidity, effect of dampness and other such matters are subjects of a vast number of letters to the bureau of standards coming from all over this country and Canada. This reveals that men everywhere are seeking the latest and best data on conditions.

* * *

An interesting discussion concerning a new high speed testing machine was presented by G. N. Krouse, University of Illinois, at the recent A. S. T. M. meeting. He pointed out that using a speed of 1500 revolutions per minute it takes about a week to determine endurance limit for a ferrous metal and much longer for some nonferrous metals. In order to speed up a test Mr. Krouse used a rotating cantilever beam type unit driven by an air turbine with speed ranging from 5000 to 30,000. As a result of five tests made on each of eight materials employing different speeds and with different finishes it was revealed that up to 10,000 revolutions per minute there seems to be no detrimental effect on results.

* * *

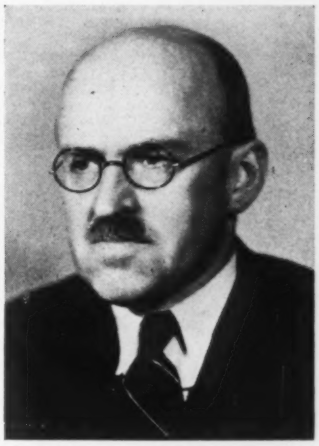
Now in operation on the coast of Scotland is a unique new device that informs ships how near they are to light vessels or lighthouses. The instruments recently were demonstrated before a meeting of the New York Electrical society. In this ingenious Scottish distance warning system the lightship sends out two signals simultaneously, one by radio and the other by air or underwater sound. The mariner listening-in hears on the radio wave a phonographic voice counting, "one mile, two miles, three miles," etc.

MEN OF MACHINES

ONE of the best known figures in engineering circles, Ralph E. Flanders has been nominated to head the American Society of Mechanical Engineers. From both the technical and sociological aspects, he is well equipped to head this prominent organization. His record (M. D., Oct., 1929) is imposing.

From high school, Mr. Flanders became a machinist's apprentice, and later a draftsman and designer. Since 1912 he has been affiliated with Jones & Lamson Machine Co., which organization he now heads.

In addition to being author of two books, one on gear cutting and another on social and economic change (M. D., Nov., 1931) he has played an important part in recent industrial and governmental activities. He holds several honorary degrees and is past president of the National Machine Tool Builders.


R. E. FLANDERS

• • •

ANOTHER name which has been behind many noteworthy engineering achievements is that of James Hervey Herron. It is therefore fitting that he should be nominated as one of the future A.S.M.E. vice presidents. His activities in this and other founder societies have been impressive.

Born in Girard, Pa., Jan. 4, 1875, Mr. Herron received his degree in mechanical engineering from University of Michigan in 1909. He had been affiliated with various companies in important positions and now heads his own consulting organization.

Mr. Herron is the inventor of an air compressor inlet valve unloader, and of a number of other devices and machines. Contributions to the technical press reveal his thorough training and understanding of engineering in general.

J. H. HERRON

• • •

THIS year's Dudley medal was awarded recently to Richard L. Templin by the American Society for Testing Materials. He is chief engineer of tests, Aluminum Research Laboratories, New Kensington, Pa. The paper for which he received the medal was entitled "The Fatigue Properties of Light Metals and Alloys," presented in 1933.

Mr. Templin, graduated from University of Kansas in 1915, has held his present position since 1919. He came to the Laboratories after two years as engineer physicist in the bureau of standards.

At the University of Illinois where he took up post graduate work as a research fellow in the engineering experiment station, he received his master's degree in theoretical and applied mechan-

R. L. TEMPLIN

ics. In addition to membership in several technical societies he is a member of Tau Beta Pi, Sigma Xi and Theta Tau.

* * *

Edward A. Johnson recently was elected vice president in charge of engineering of International Harvester Co., Chicago. He has been associated with the company since 1894.

* * *

R. R. Fauntleroy, Moline Malleable Iron Co., St. Charles, Ill., was re-elected president of the Malleable Founders' society at the recent annual meeting in Cleveland.

* * *

L. E. Jermy, editor of Machine Design, has been re-elected chairman of the Cleveland section of the American Society of Mechanical Engineers.

* * *

Lee B. Green, formerly works manager for Globe Machine & Stampings Co., Cleveland, has been elected director and vice president in charge of operations of the company.

* * *

Dr. Irving Langmuir, General Electric research laboratories, and Dr. Henry Russell, Princeton university, have been awarded the Franklin medal of the Franklin Institute, for their discoveries in the physical sciences.

* * *

Glen D. Angle has joined the Winton Engine Co., Cleveland, as divisional engineer in charge of development work. He has been conducting a consulting engineering practice in Cincinnati.

* * *

Walter P. Chrysler, head of the Chrysler Corp., has been elected to the board of the New York Central railroad. He succeeds C. B. Seger, resigned.

* * *

Robert S. Archer has been appointed chief metallurgist of the Chicago district for Republic Steel Corp. He has been director of metallurgy for A. O. Smith Corp., and prior to that was in charge of the Cleveland section of Aluminum Research Laboratories, Aluminum Co. of America.

* * *

E. H. Smith, formerly assistant chief engineer of Pontiac, and E. A. Weiss, formerly with Willys-Overland and Continental engineering departments, have joined the engineering staff of Packard Motor Car Co. Charles M. Lejust is the new contact man between purchasing and engineering departments.

* * *

Cassius M. Davis, one of the assistant engineers of General Electric company's transportation engineering department at Erie, Pa., has been appointed engineer of the department, succeeding H. L. Andrews, who has been made a vice president of the company.

* * *

B. J. Cross, who from 1921 to 1931 was associated with the engineering activities of Combustion Engineering Corp., New York, has rejoined the engineering department of the present organization, Combustion Engineering Co. Inc. He will be engaged in development and research work under the direction of John Van Brunt, vice president in charge of engineering, and of Henry Kreinsinger.

* * *

Nels A. Tornblom has been appointed chief engineer of Appleton Electric Co., Chicago, succeeding E. G. K. Anderson.

* * *

William B. Henderson, secretary of the Machinery and Allied Products code authority, has been appointed executive vice president of the refrigerating machinery association.

* * *

D. P. Heath, Detroit consulting engineer, has joined the McCord Radiator & Mfg. Co. as assistant to J. D. Harris, chief engineer of the company.

* * *

Karl F. Schmidt has been appointed chief engineer of the household appliance division of Fairbanks, Morse & Co.

* * *

D. M. Avey, editor of *The Foundry*, has been nominated as president of the American Foundrymen's association.

* * *

C. H. Nehls has been made chief engineer of the Detroit plant of Yale & Towne Mfg. Co.

* * *

F. A. Bower, chief engineer of Buick Automobile Co., recently was the recipient of the honorary degree of doctor of science at Villanova college.

* * *

Dr. Bruce W. Gonser recently was made a member of the technical staff of Battelle Memorial institute at Columbus, O.

* * *

C. A. Adams has been elected to serve for another year as director of the American Bureau of Welding.

* * *

W. H. Manning has been appointed assistant chief engineer in charge of experimental work of Pontiac Motor Co.

* * *

R. C. Muir has been elected vice president in charge of the engineering department of General Electric Co., Schenectady, N. Y. C. E. Tullar now is vice president in charge of the patent department.

* * *

Sheppard T. Powell delivered the ninth Edgar Marburg lecture at the 1934 meeting of the American Society for Testing Materials.

* * *

A. D. Hunt recently was appointed manager of engineering at Westinghouse South Philadelphia Works, succeeding John M. Lessells, who resigned to open an office as consulting engineer, specializing in mechanical engineering.

* * *

Otto Cullman, president of the Cullman Wheel Co. Inc., Chicago, broke into print recently with an interesting vol-

(*Concluded on Page* 60)

Labor-Saving Farm Machines Create Employment

IT MAY seem paradoxical for us to say that labor-saving farm machinery creates employment, but history demonstrates that such actually has been the case, according to Theo Brown, experimental department, Deere & Co., who spoke at a recent meeting of American Society of Agricultural Engineers.

In fact, the records of the past impel us to believe that employment really began with the introduction of the labor-saving farm machine, and that it has been increasing steadily in a volume quite constant in ratio to the extension of the practice of mechanization. Prior to the introduction of the labor-saving machine, every human being, upon attaining the adult state, had to be self-sufficient in his ability to wrest from nature the sustenance necessary to maintain his existence.

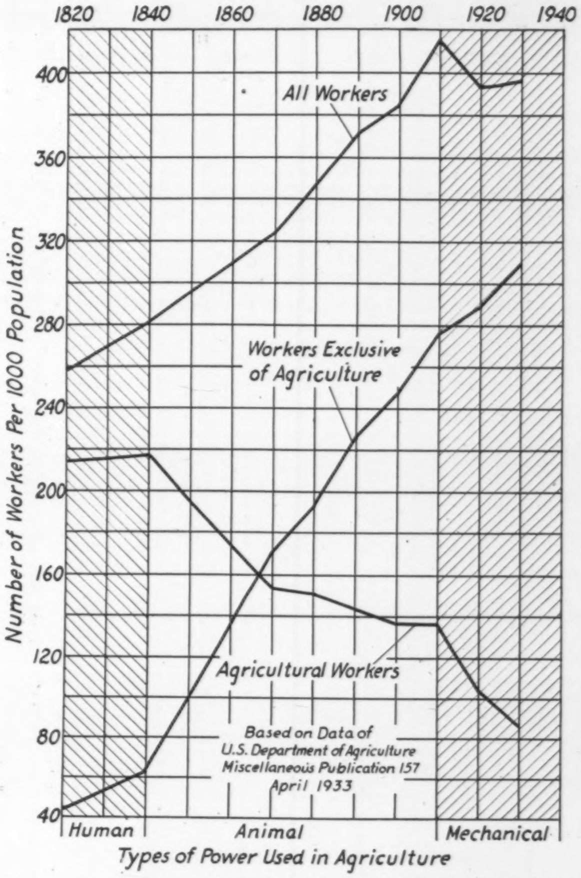
From the birth of man until the introduction of the first crude labor-saving farm machine, the chief occupation of people all over the world was the production of food and clothing. When this had to be done without the aid of tools of any kind, the task so completely occupied their time that there was little opportunity for anybody to do anything else.

Formed First Crude Tools

Then came the age when man began to climb the ladder of civilization and started to look around for assistance in securing his necessities of life. He then formed the first crude plow and hitched it to a draft animal. He fashioned a sickle which speeded up the work of his womenfolk. The threshing floor, where the seed was trod from the head, made threshing faster and easier. These crude machines increased the productive capacity of the individual worker, and some of the people were freed from the task of producing food and clothing.

With increased production capacity on the part of the individual worker, there began to develop surpluses of food products which could be sent to other tribes and exchanged for surpluses of other things for which there was need.

To understand how labor-saving machines create employment, it will be necessary for us to turn to the field of economics, rather than to that of mechanics. In 1820 each farm worker had only 0.35 bushel of wheat for each hour of his labor to exchange for the products, or services, of other workers who did not grow their own wheat. Naturally he could buy but little of those products or services, and so employment outside of agriculture was strictly limited. Actually it was only 43 per thousand population.

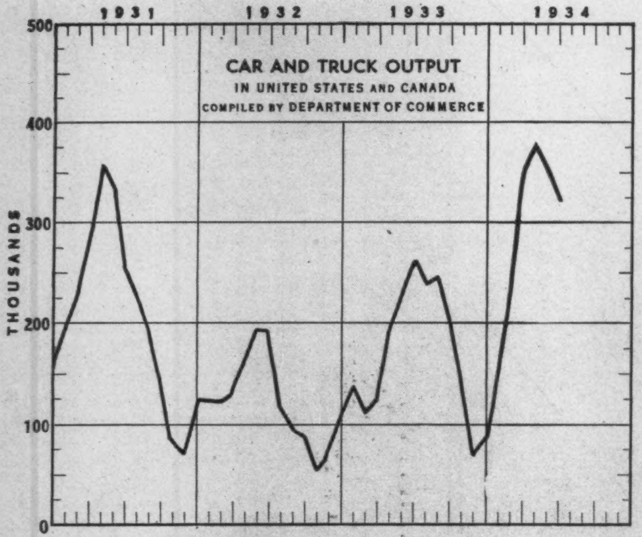


General employment shows definite increases as labor-saving machinery is adopted on farms

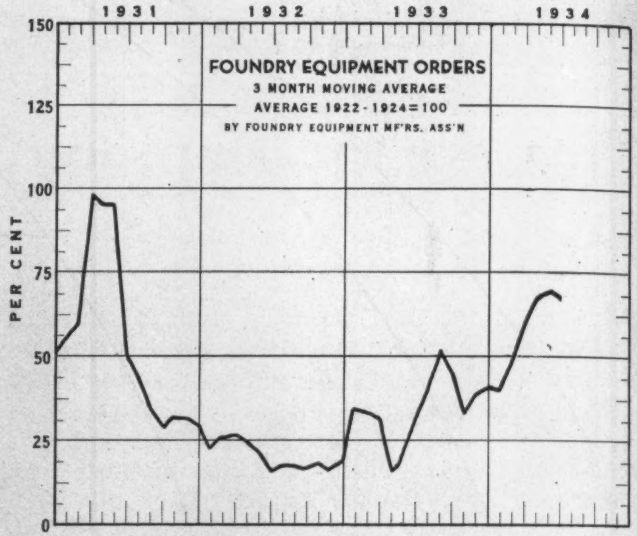
Then came the farm machine which made it possible for the 1896 farm worker to produce nearly six times as much per hour of his labor as did the 1820 worker. With six times the amount of wheat to exchange for the products or services of other workers, there was a growing demand for things other people produced. This increased demand meant more employment for workers outside of agriculture, and in 1896 about 240 per thousand were engaged otherwise.

The record of the past 110 years—as will be seen from the accompanying chart—demonstrates that as the labor-saving farm machine has been perfected and its use extended, total employment has been expanded. Of course there has been, and probably will be, temporary recessions in employment due to economic conditions, rather than to mechanization. From each of these recessions in the past we have recovered, not through abandoning machine methods, but rather by more extensive use of labor-saving equipment. This we will do again.

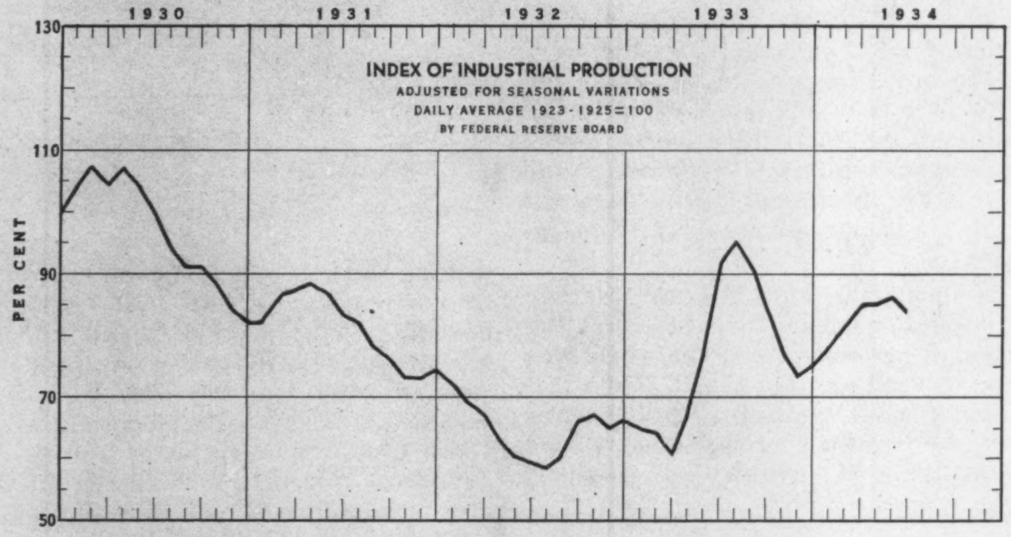
How Is Business?



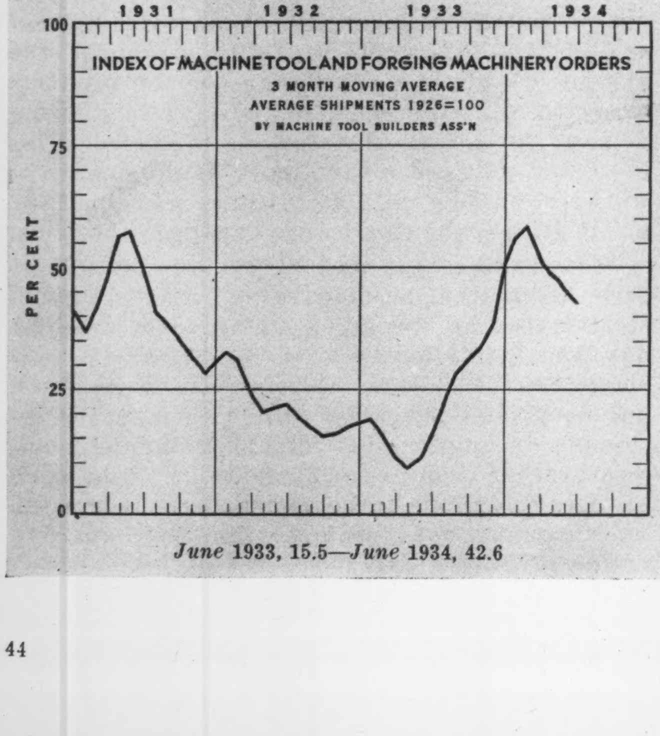
June 1933, 257,050—*June* 1934, 321,956



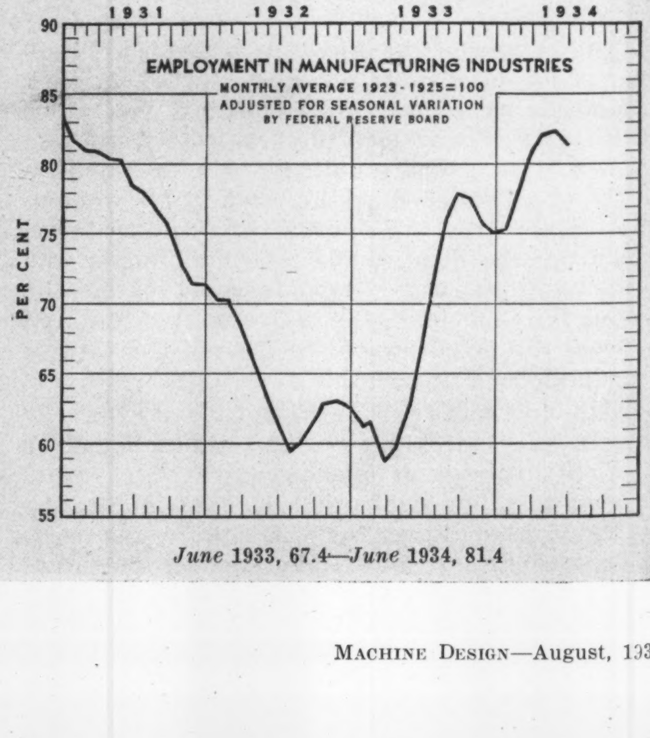
June 1933, 30.2—*June* 1934, 68.3



June 1933, 91—*June* 1934, 84



June 1933, 15.5—*June* 1934, 42.6



June 1933, 67.4—*June* 1934, 81.4

NOTEWORTHY PATENTS

SPEED control in apparatus for sound recording and reproducing requires careful consideration and it is therefore the aim of E. H. Greibach to provide a device to meet this requirement. The mechanism, *Figs.* 1 and 2, recently was granted patent No. 1,962,303 which has been assigned to Westinghouse Electric & Mfg. Co.

Rotary motion is transmitted to gear 8, *Fig.* 2, from a prime mover (not shown) and from the gear to flywheel 5 through a spiral spring 12, *Figs.* 1 and 2. In sound recording and reproducing however, approximate uniformity of film travel such as obtained by this combination spring and flywheel, is not enough, since the slightest variation in the speed of the film will result in a distorted record.

The inventor has, therefore, added a viscous braking or damping device to the apparatus. This mechanism comprises a leather ring 20 that is held against one face of the flywheel by plate 21. The plate and the surface of the flywheel against which the leather ring bears are provided with an annular channel 22. This channel in the plate is kept filled with oil through a tube 23, *Fig.* 1.

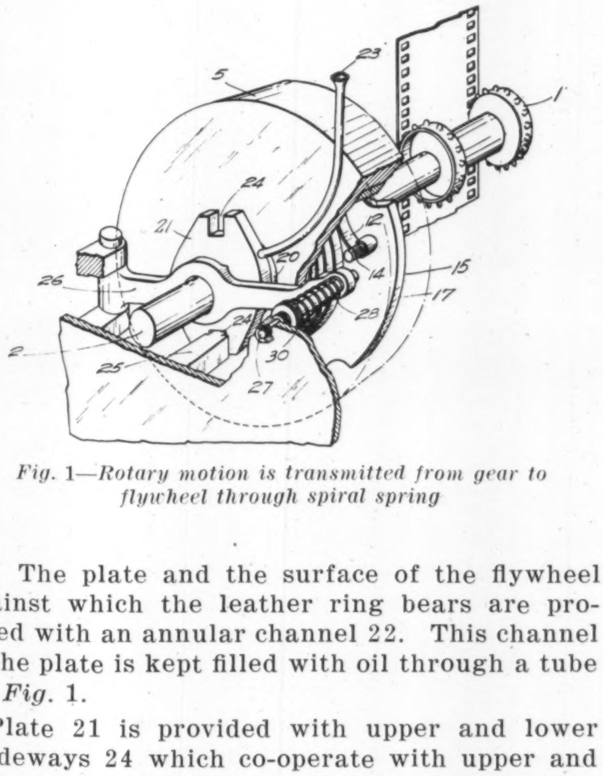


Fig. 1—Rotary motion is transmitted from gear to flywheel through spiral spring

Plate 21 is provided with upper and lower guideways 24 which co-operate with upper and lower rails 25 to maintain the plate always parallel with the face of the flywheel. Pressure is applied to the plate by pivoted member 26, the free end of which has an opening for receiving pin 27. Spiral spring 28 surrounds the pin, one end of the spring bearing on the free end of member 26 to exert pressure on it. Adjustable nut 30 is employed to alter the pressure. Braking force always must be proportional to the velocity of the flywheel and in this case a braking force of the required character is supplied by the oil, although other liquid having the property of viscosity may be used.

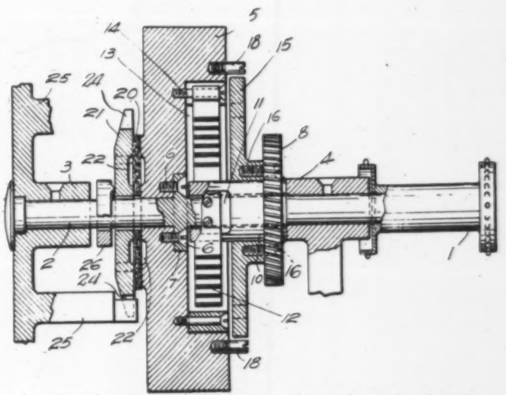


Fig. 2—A viscous braking or damping device is employed to prevent fluctuations in speed

A STOP for rotating parts has been patented by E. M. Shinkle, United States army, for use by the government. Applications of the device, *Fig.* 3, include transmissions of automobiles. When an automobile is moving rearward under the action of its transmission gearing and the transmission is shifted to neutral or to any forward gearing, the stop mechanism will not operate to prevent backward movement until after the intended rearward motion of the vehicle has stopped and the vehicle has moved forward.

More specifically, when the gears are shifted to reverse, control rod 14 pushes plunger 12 to one side against compression of spring 13, thereby rocking lever 10 and withdrawing bar 9, *B* and *C, Fig.* 3, from notch 8 to free pawl 5. Movement of gear 17 in a clockwise direction, *A,* will cause pawl 5 to rock upon shaft 4 to release gear 17. By reason of friction elements 16 contacting gear 17, pawl 5 will be held in its rocked position as long as gear 17 moves in a clockwise direction. Thus it will be seen that it is impossible to cause pawl 5 to engage gear 17 while the vehicle, after being operated in reverse, continues to drift under the momentum received,

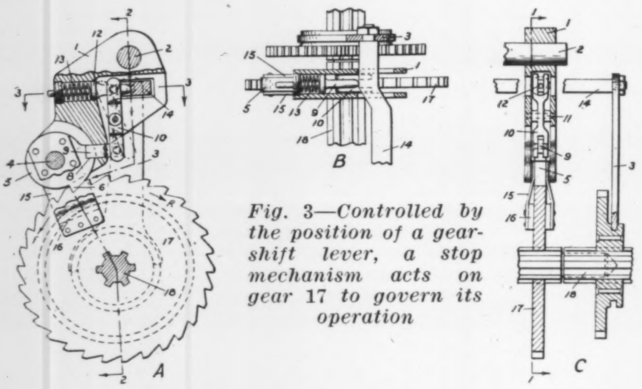


Fig. 3—Controlled by the position of a gear-shift lever, a stop mechanism acts on gear 17 to govern its operation

thereby avoiding the shock and strain incident to engagement of the pawl with the gear while in motion.

When the direction of rotation of gear 17 is forward (counterclockwise) plates 15 and pawl 5 will be rocked in a direction to cause pawl 5 to engage through its tooth 6, with gear 17, in which position bar 9 will again enter notch 8 under action of spring 13. Further rotation of gear 17 in a counterclockwise direction then will rock the body about shaft 2; pawl 5 will clear the teeth of the gear until such time as pawl 5 may be rocked into operative position.

Number of the patent is 1,963,104.

ELECTROMAGNETIC force is employed in a brake designed by Morris B. Chambers for the Chambers Electric Brake Corp., Seattle, Wash. A patent covering the mechanism recently was granted, the number of which is 1,958,608. As shown in *Fig.* 4, the brake band comprising the brake lining 17 and steel band 18 secured to shoes 19 and 19^{a}, extend about and within flange 11. This band normally is out of contact with the flange, being held in retracted position by spring 23. Pull of magnets 21 and 21^{a} need be but little more than that necessary to overcome the tension of spring 23. However, another pair of electromagnets 26 and 26^{a} are installed to cause lining 17 to bear upon flange 11 with a strong pressure. This pair of magnets may be used in conjunction with 21 and 21^{a} or either pair may be used alone.

Magnets 26 and 26^{a} are of the horseshoe type and their pole pieces face the side of the brake drum 10. Therefore the brake drum is in magnetic fields of the magnets and serves as the armature. When the magnets are energized they are drawn into frictional engagement with the drum or in other words with a wear ring 32 mounted on and concentric with the drum. Frame 27 moves with the magnets toward the drum, thus flexing resilient links 29 which when the magnets are deenergized move them out of contact with the drum or ring 32.

Assuming that the brake drum 10 is turning in an anticlockwise direction, the energization of magnets 26 and 26^{a} causes frame 27 to swing in the same direction and the sleeve 42, carried thereby, pushes the lower end of lever 35^{a} to the right into a position indicated by the broken lines. Lower end of the other lever 36^{a} is held against movement in that direction by stop 39. Cam 35^{a} pushes brake shoe 19 away from the keeper 16 and causes lining 17 at the shoe to seize flange 11. Thus the brake band is expanded. If the drum is turning in the opposite direction lever 36^{a} is swung and brake shoe 19^{a} is moved away from the keeper.

Circuit for the magnets, will of course, be controlled by the operator through a suitable controller. When the circuit is closed through magnets 21 and 21^{a} mounted in each of the brake shoes 19 and 19^{a}, the lines of force pass outwardly from one pole piece into flange 11 of the brake drum, then back to the other pole piece and through the body of the magnet to the pole piece where it is assumed they started. Flange 11 thus becomes the armature and the magnets are drawn toward it to force lining 17 into contact with flange 11.

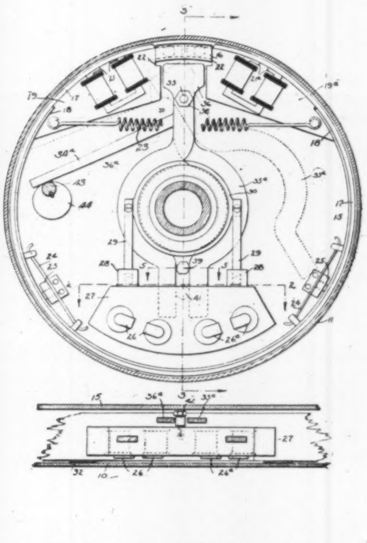


Fig. 4—Brake band is expanded into frictional contact with flange by means of electromagnetic devices

DESIGN always is most successful when it broadens the application of a particular machine or mechanism. The logic of this statement is borne out by the invention of a hammer mill by E. G. Myers for Myers-Sherman Co., Chicago. The unit, *Fig.* 5, is employed not only to grind and pulverize fodder for making meal and other finely ground feed, but it may be converted into a corn cracker.

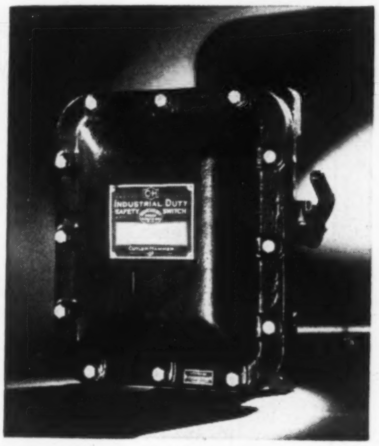
When it is desired to have the hammer mill operate for its usual purpose, which is grinding or pulverizing materials for making meal, the panel or door 24 is arranged in a closed position. During operation, hammers 11 rotating at terrific speed grind the material which then will fall into receptacle 18. The fan or blower 13

(*Concluded on Page* 63)

NEW MATERIALS AND PARTS

Introduces Explosion Proof Switches

A NEW line of explosion proof safety switches for use in class I, group D, hazardous locations has been introduced by Cutler-Hammer Inc., Milwaukee. This new line includes both single and double throw types in standard sizes up to 200 amperes capacity. The switch, shown herewith, is a heavy, industrial type A construction, with outside operating handle, mounted in a weather proof, cast semisteel enclosure. A machined flange of required width between the case and cover assures proper cooling of any flame which might occur from an explosion within the case.



Explosion proof switches are intended for application on machines to be located in hazardous locations

Specific applications for these switches include machines for such locations as distilleries, dry cleaning plants, petroleum refineries, bulk oil stations, filling stations, gas plants, spray painting plants, chemical works, paint, lacquer and varnish works, etc.

Bearing Units Are Self-Aligning

INSTALLATION of industrial ball bearing units has been simplified by the self-locking collar and wide inner ring design being manufactured by Fafnir Bearing Co., New Britain, Conn. However, it is sometimes possible to simplify installation still further by employing cartridge type units, shown herewith, rather than the more conventional pillow block. It is supplied assembled and is held in place on the machine by bolts through the cartridge flange, thus eliminating the necessity for boring operations.

FAFNIR
PAT NOV 10 1925

Self-aligning bearing compensates for possible shaft misalignment while simple seals exclude dust and dirt

The self-aligning bearing compensates for shaft misalignment should it occur, and simple seals exclude dust and dirt. The unit, which is compact, is furnished for shaft diameters from 9/16 to 2 3/16 inches.

Motors Are Protected Against Dust

DIRECT current motors designed for those applications where dust, dirt, moisture, or other foreign matter is present in large quantities, have been introduced in an improved line by General Electric Co., Schenectady, N. Y. The new motors, shown herewith, are totally enclosed and fan cooled, and are available in a wide variety of electrical and mechanical modifications in sizes from ½ to 200 horsepower.

A system of dual ventilation is utilized. This together with watertight conduit boxes, and labyrinth seals at the cartridge-type bearing housings effectively protects the working parts of the motor. An internal fan draws the warm air from the windings and core and circulates it around the totally enclosed interior of the motor so that it gives up its heat to the frame and end shields. An external fan draws cool air in through mesh openings in an outer end shield and directs it over the surface of the magnet frame and inner end shields. Close clearances between the end shields and the bearing housings, and grease seals along the shaft prevent foreign particles from entering the motor.

Motor is designed for those applications where dust, dirt, moisture or other foreign matter is present in large quantities

Small Current Operates Unit

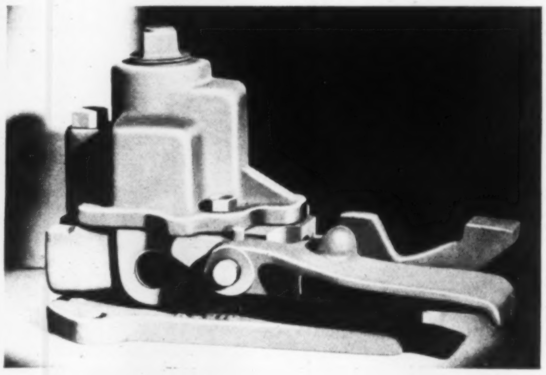
ELECTRONIC industrial control devices in a full line for initiating a control function from an actuating impulse as brief as 1/5000 of a second have been brought out by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. The impulse may be a minute current or voltage received from a phototube, delicate contacts, control circuits, or similar sources where the impulse is too small or too brief to actuate directly the usual type of relay. Equipments are available which will maintain the response indefinitely or for an adjustable predetermined length of time. These devices are, in effect, photoelectric high-speed lock-in controllers.

Electronic control units which will maintain the response indefinitely or for an adjustable predetermined length of time are now available

The type RR-4 phototroller, shown herewith, has the output power supplied by two high current amplifier tubes in parallel and has an entirely electronic time delay feature to re-establish the output current in a given time after the control impulse has caused it to stop flowing. No relays or other mechanically moving parts are used so that the equipment will withstand an indefinite number of operations without requiring replacements.

New Valve Is Foot Operated

A SPOOL or piston which is fluid balanced in all directions is the principal moving part of the new foot-operated valve introduced by the Hanna Engineering Works, 1765 Elston avenue, Chicago. The fluid pressure does not affect movement of the spool either by force or friction, consequently the valve moves freely.



Foot operated valve is designed for either three or four-way distribution

The valve, shown herewith, is for either three or four-way distribution. The spool moves 7/16 inch for a full reversal of fluid distribution while the pedal for foot operation moves through an angle of 10 degrees. All connection openings are horizontal and are near the floor where piping lines will present the least obstruction. The valve is suited for actuation automatically by the cylinder unit it controls as only a short movement and a light force are required. This also makes it adaptable for solenoid or other types of remote control.

Announces Bearing Stock

PERMITE leaded phosphor bronze bars are now available in standard six foot lengths in diameters from ⅝ to 2 inches in 1/16-inch steps, according to an announcement of Aluminum Industries Inc., Cincinnati, O. All standard bearing bronze alloys may be supplied. Using tungsten carbide tools, the stock has been successfully

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M-R-C SINGLE-ROW RADIO-THRUST GURNEY TYPE

The Radio-Thrust or Angular-Contact type of bearing was originated by F. W. Gurney in 1909. It is capable of taking a heavy thrust load in one direction in addition to its radial rating. Important recent developments in M-R-C Radio-Thrust construction materially increase its capacity at medium and high-speeds.

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INSTALLATION supervision is as much a part of M-R-C service as the bearings themselves. Not only must the bearings be right from the standpoint of design, size and capacity, but experienced M-R-C engineers will see to it that they are correctly sealed, housed and lubricated.

Thirty-six years of accumulated knowledge of the design, manufacture and installation of Ball Bearings . . . the combined experience of three pioneer organizations of outstanding recognition . . . responsibility for the origination and development of eleven basic bearing types, is the heritage of experienced Leadership that rests today in the hands of men who are competent to help you interpret your bearing requirements and install them correctly.

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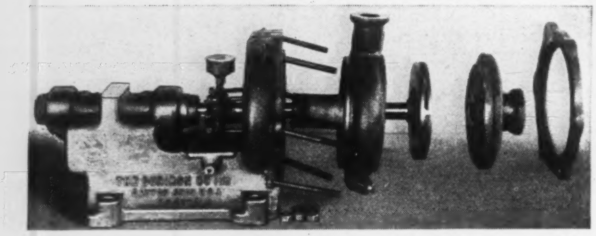
machined at speeds in excess of 1500 surface feet per minute, without a coolant. A turned finish has been adopted for the Permite bars.

Announces Centrifugal Acid Pumps

REDESIGNED centrifugal pumps for acids and alkalies have been brought out by Duriron Co., Dayton, O. These new pumps, procurable in a number of corrosion resisting alloys, have a one-piece base with extra large clamping yoke cast integral. The volute is held under compression, eliminating strain. Closed type impellers are used with two or more sizes for each pump. Bearings are removable bronze sleeves made of a special alloy and the entire assembly is extremely simple. Several of the models are available in self-priming types as well as the standard centrifugals.



Centrifugal pumps for acids and alkalies are procurable in a number of different alloys

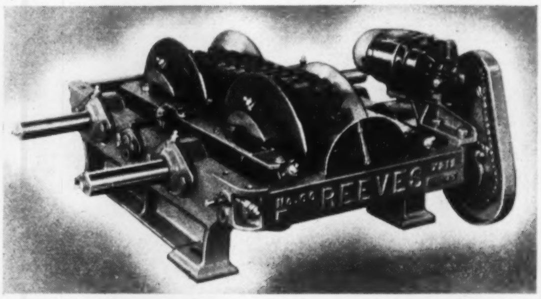
Electrode Gives Ductile Deposit

TO OVERCOME the difficulty usually experienced in welding steels containing more than 0.2 carbon, Metal & Thermit Corp., 120 Broadway, New York, has developed a new heavy coated electrode known as Murex Special A. The new electrode hinders the migration of carbon from the parent metal to the deposited metal when welding and assures a more ductile deposit. Tensile strength of the deposits, which contain a small quantity of nickel, is 73,000 pounds per square inch. Elongation in 2 inches is 31 per cent and reduction in area 63.5 per cent.

Transmission Controls Improved

IMPROVEMENTS in the design of electric remote and electric automatic controls for variable speed transmissions have been announced by Reeves Pulley Co., Columbus, Ind. Both types of controls depend basically on a fractional horsepower reversible motor which actuates a speed shifting screw. On the more generally used sizes of transmissioin, the motor is now provided of simplified design and smaller size. It embodies fewer operating parts than heretofore, and hence is more quiet in operation and longer lived. Its shape and size make it possible to mount it in practically any convenient position. The control may be installed on units already in service and on either vertical or horizontal designs of transmission.

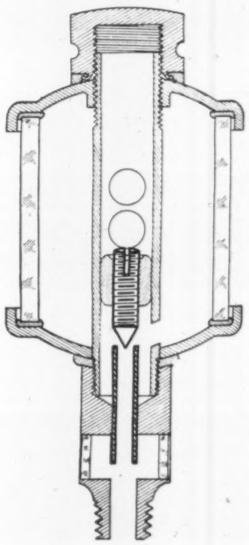
The motor, operating on either alternating or direct current, embodies a built-in speed reducer which can provide any ratio up to 1000:1, and a special safety clutch which protects the motor in case of overload. This clutch eliminates the use of a solenoid brake, heretofore used.



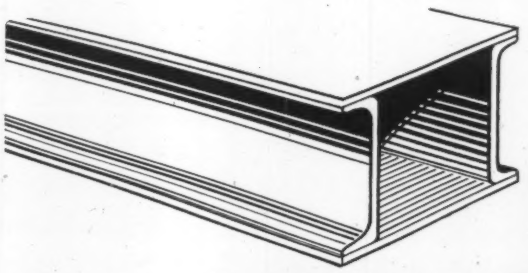
Control motor on variable speed transmission embodies a built-in speed reducer

Redesigned Lubricators Announced

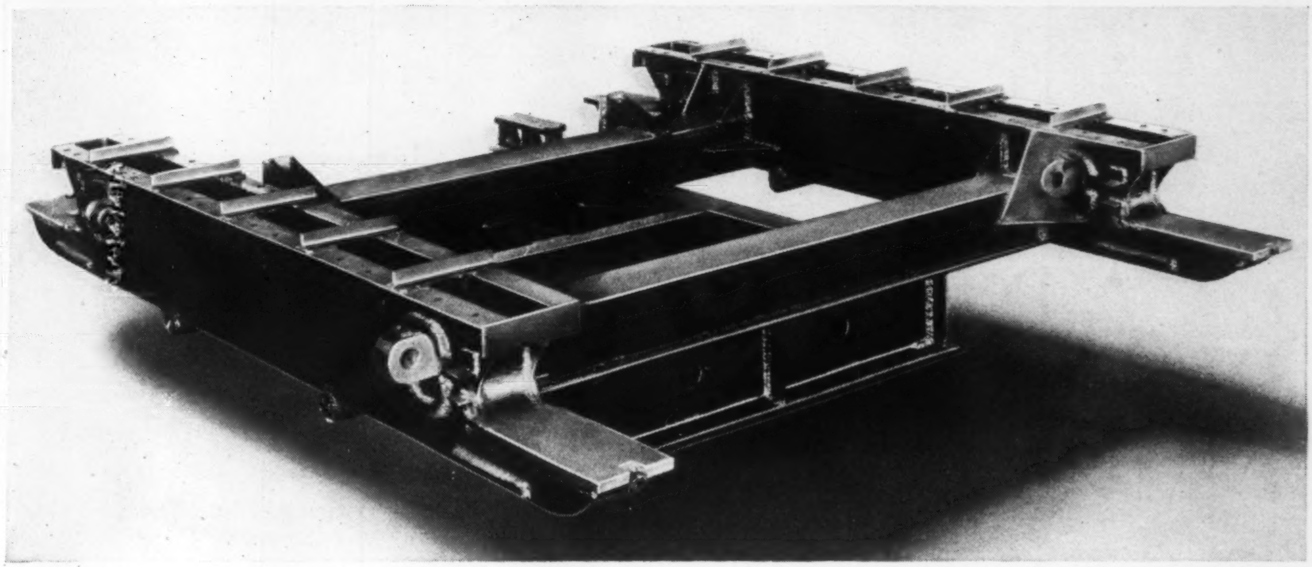
RECENT improvement in the new 1000 series automatic force-feed lubricators of Victor Lubricator Co., 3900 North Rockwell street, Chicago, include the replacement of brass by cadmium plated steel for greater strength and to reduce breakage loss. A new sight feed provides visibility of reservoir supply as well as rate of



Lubricators are of airtight construction, completely self-contained, and feed oil by pressure generated within the unit



The Box Section . . . One of ROLLED STEEL'S Answers to the Need for Reducing Weight . . .



MANY a product today is handicapped by excessive weight—weight which closes distant markets . . . adds to material costs . . . increases freight bills needlessly.

Rolled steel is providing the means of reducing weight in machine construction. A typical instance is in the use of box sections fabricated from rolled steel sections and plates. For fifty years the box section has demonstrated its engineering soundness in its application to structures—notably as chords in bridge trusses. The box section has excellent resistance to torsion, compression, bending, and tension stresses. Hence it provides rigidity and resistance to deflection without excessive weight. Illustrated here is a main frame for a small excavator.

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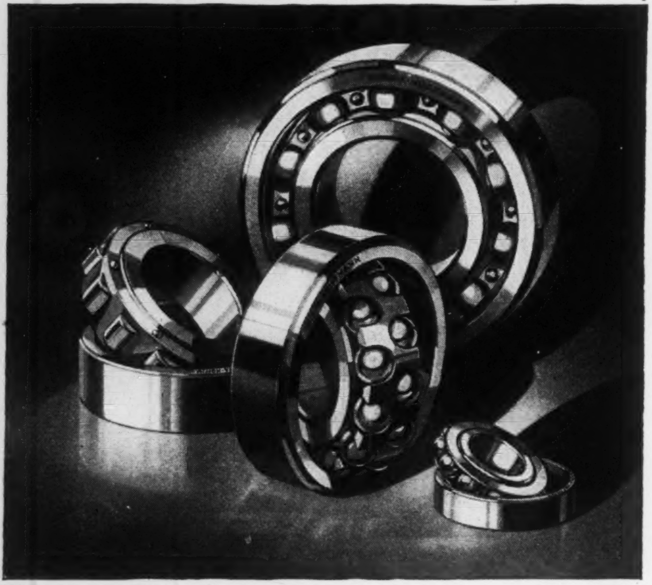

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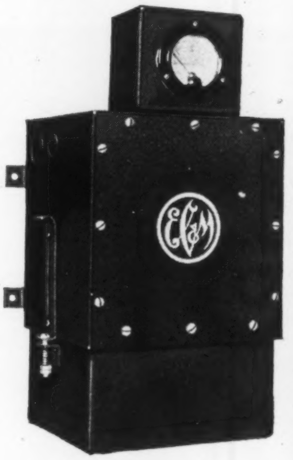
feed. Larger filler tube permits faster filling, and a new top stamping, drawn and threaded, eliminates the hex nut formerly required. The cap retaining wire previously used is eliminated by a cap redesigned to include a patented washer retainer, while a new valve control inside the filler tube discourages tampering with the initial adjustment.

The lubricators, shown herewith, are of airtight construction, completely self-contained, and feed oil under pressure generated within the lubricator (not by gravity) as dictated by the needs of the bearing. Oil temperature variances, by causing expansion or contraction of the fractional cubic inch of air imprisoned near the base of the filler tube, regulate the rate of oil flow.

Starter Has Remote Control

FOR motors up to 15 horsepower, 220 volts, and 30 horsepower, 440-550 volts, Electric Controller & Mfg. Co., East Seventy-ninth street and Woodland avenue, Cleveland, has brought out the type ZO across-the-line oil immersed starter which is weather proof and dust tight. These starters, shown herewith, are enclosed in a case which has been bonderized and then black enameled. When desired, a self-contained ammeter in a dust-tight case can also be furnished. The starter is arranged for remote control, push button automatic operation.



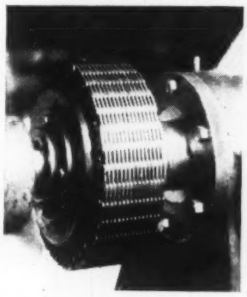
Self-contained ammeter in a dust-tight case can be furnished with oil immersed starters

Pump Incorporates Automatic Relief

DESIGNED for pressure atomizing oil burners, the new automatic fuel unit added to the line of Sundstrand Machine Tool Co., Rockford, Ill., consists of a variable displacement pump and a strainer, the pump automatically taking care of the work done by valves, thus entirely elimi-

POWER TRANSMISSION NEWS

More Than One Way to Join Two Shafts



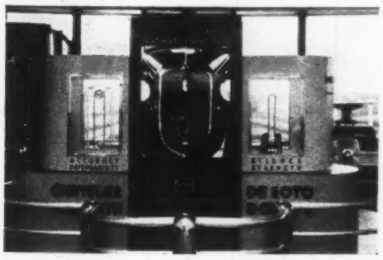
Modern power transmission frequently requires not only the positive coupling of shafting but more or less flexibility to compensate for any slight misalignment that may be present.

One ingenious solution of this problem is accomplished by a unique assembly developed by the Morse Chain Company, of Ithaca, N. Y., and is as simple as it is efficient.

The assembly consists of two sprockets fastened securely to the ends of the shafting, wrapped by a Morse Silent Chain, entirely enclosed in split covers and packed in grease.

The flexible chain transmits the load between the sprocket halves and, due to the great number of contact points between the links in the chain and the sprocket teeth, the load is so distributed that tress at any one point is small. The action of the chain connection between the sprockets cushions shock, dampens vibration and provides the necessary flexibility. Easily attached or disconnected, either half can be moved without disturbing the other half.

Morse Exhibit at Century of Progress



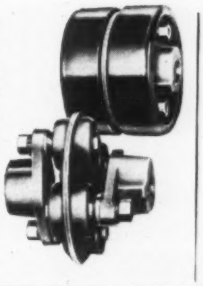
Morse Chain Company have a unique action exhibit in the Chrysler Building. A Translux picture is used, showing the front end of a Plymouth car with timing chain in action. This, with two striking demonstrations of smooth action, shows the accuracy and efficiency of Morse Chains.

Misalignment in Shafting

Where the angular distortion is not high enough to require universal joints, a new flexible coupling has been developed by the Morse Chain Company that takes care of misalignment up to 6°.

This is known as the Morflex Coupling. It depends upon rubber as the flexing medium and compensates for both angular and parallel misalignment without a measurable loss of power.

Recent developments and knowledge of the physical properties of rubber have brought it into extensive use in engineering fields. Properly used, it is superior to other materials in providing the qualities required in a flexible coupling.



Driving Tanning Drums

We have come a long way since we tanned a hide by "nailing it on the fence." The leather industry is becoming more and more mechanized and they find increasing use for positive power transmission.

The Deford Company, leather manufacturers of Luray, Va., installed Morse drives about a year ago on their Kannel Process tanning drums. They report, "These drives are working perfectly."

CHAMP CHAIN!

POWERFUL · FLEXIBLE · SMOOTH

. . . and how he can take it!

Chain drives knock 'em all out when you consider their long life and low maintenance costs. They parry every blow, never take the count. No matter how hard the punishment, chain drives always stay in the ring. They have been taking it for many years and getting better all the time.

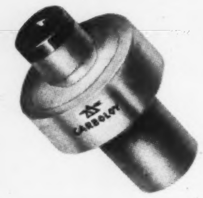
MORSE CHAIN COMPANY

A Division of Borg-Warner Corporation

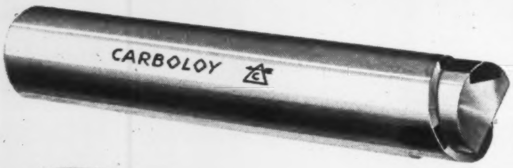
ITHACA, NEW YORK

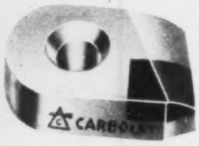
Are your wear problems more severe than these?

Grinder Rests are a severe test of the wear resistant qualities of any metal. This Carboloy Rest, used in cleaning welding rod, lasts for months as compared to days with other grinder Rests.

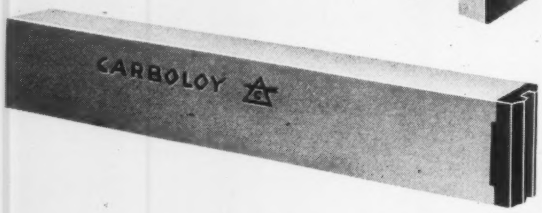


Carboloy Coating Plate used for coating flux on welding rod. Former plates coated 1500 rods per every .001" wear on I.D. while Carboloy Coating Plate run 180,000 rods per .001" wear on I. D.





The four Carboloy equipped tools shown above, at right, and below are examples of the use of Carboloy on wire forming operations. All are most exacting applications. Use of Carboloy lowers production time per part and produces more uniform parts.



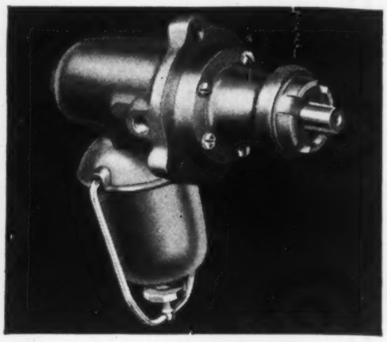
All of the applications shown above are examples of the successful use of Carboloy cemented carbide on parts subject to rapid abrasive wear. In each case just a small insert of Carboloy increases the life of the part from 10 to 25 times.

Carboloy cemented carbide may be the economical solution to the problem of rapid abrasive or corrosive wear on *your* machine parts. You can obtain either the complete part equipped with Carboloy, or just the Carboloy blank hardened and shaped to your requirements. Write for any further details desired, enclosing sketch or blueprint of your part if you wish specific data on your applications. No obligation.

CARBOLOY COMPANY, INC.
2477 E. GRAND BLVD., DETROIT, MICH.
Chicago Cleveland Newark Philadelphia Pittsburgh

CARBOLOY
REG. U. S. PAT. OFF.
CEMENTED CARBIDE

nating all of the valve mechanism previously required to operate a pressure type oil burner. This new pump, shown herewith, displaces, with no by-passing, only as many gallons of fuel per hour as is determined by the nozzle size, the pump automatically pumping the correct volume without requiring any adjustment for different sized nozzles. Automatic air relief or air bleed is also incorporated.

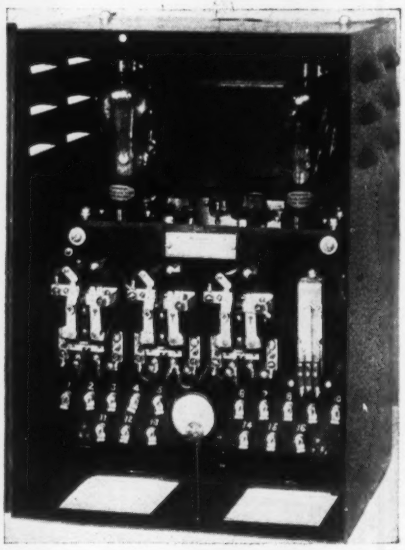


Automatic fuel unit supplies the correct volume without requiring any adjustment

An advantage of this structure is the provision of a quiet running pump with low power consumption as only the fuel that is actually burned is pumped. Other features include: Full pressure and volume at the start of combustion is provided, with instantaneous and positive cutoff of oil to the nozzle so that there is no dripping of oil when the burner is stopped.

Electronic Unit Controls Cutting

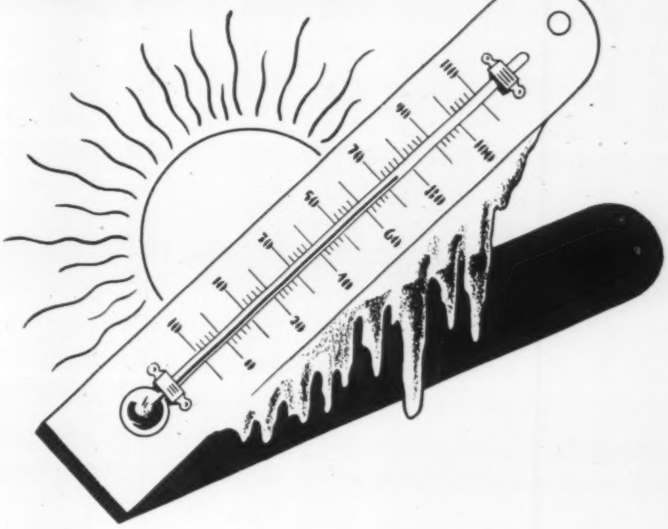
FOR use in regulating high speed cutting of paper, cellophane, cloth and similar materials in accordance with printed matter, labels or other patterns where both forward and reverse correction of the position of the material is required, Westinghouse Electric & Mfg. Co.,



Electronic unit can be used to regulate the high speed cutting of paper, cellophane, cloth and similar materials in accordance with printed matter

COMFORT

When Winds Blow Hot
When Winds Blow Cold



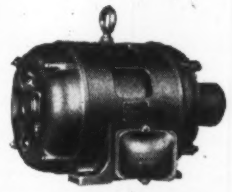
AIR CONDITIONING

Continuous operating dependability is the greatest factor in assuring popular demand for air conditioning equipment . . . Cool comfort in Summer . . . Warm comfort in Winter . . . Healthful surroundings throughout the year.

Much depends on the motor. And, much has been contributed by Century. Beginning with the development and pioneering stages, Century has always played a necessary part in bringing Air Conditioning Equipment to its present stage of acceptance, through dependability and cost of operation.

We invite requests for engineering co-operation . . . whether your application calls for Single Phase, Polyphase, Direct Current, Multispeed, Open, Enclosed, Totally Enclosed Fan Cooled or Explosion Proof Motors. Up to 600 Horse Power.

CENTURY ELECTRIC COMPANY
1806 Pine Street · · · St. Louis, Mo.
Offices and stock points in principal cities



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SPLASH PROOF

EXPLOSION PROOF

for

Century
MOTORS

COMMERCIAL REFRIGERATORS · OIL BURNERS
STOKERS · FANS · BLOWERS · VENTILATORS

GARLOCK
7021

"It's the Best Sheet Packing for extreme pressures and high temperatures!"

That's the way designing engineers feel about Garlock 7021 High Pressure Compressed Asbestos Sheet Packing.

Garlock 7021 was especially developed for severe service against oil or steam at extreme pressures and temperatures. It has established an enviable record on all types of equipment.

Specify Garlock 7021 for any gasketing job on which compressed asbestos sheet is to be used.

THE GARLOCK PACKING COMPANY
Palmyra, New York
In Canada: The Garlock Packing Co. of Canada, Ltd., Montreal, Que.

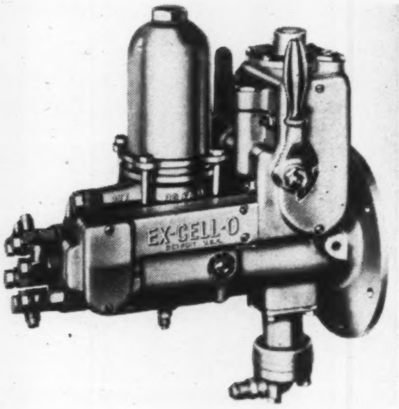
GARLOCK
Quality Controlled
PACKINGS

East Pittsburgh, Pa., has brought out a new register cutter regulator. The equipment, shown herewith, is preferably arranged to operate from phototubes, receiving impulses from a spot on the paper. Operation may be obtained also from contact operated by a small perforation in the material or by a conduction section.

The equipment comprises three units, the phototroller which contains the amplifier, relays and control equipment, the "scanner" which consists of the light source, phototube housing and accessories for scanning the paper, and the "synchronous selector," a rotary limit switch which selects the direction of corrective action.

Fuel Pump Has Two Parts

SIMPLIFIED standard fuel injection pumps for use with diesel engines have been introduced by Ex-Cell-O Aircraft & Tool Corp., Detroit. The pump, shown herewith, consists of two major parts, the drive unit and the hydraulic unit. The drive unit is mounted directly on the engine, making it practically a part of the engine structure, while the hydraulic unit is removable and is furnished as a sealed assembly.



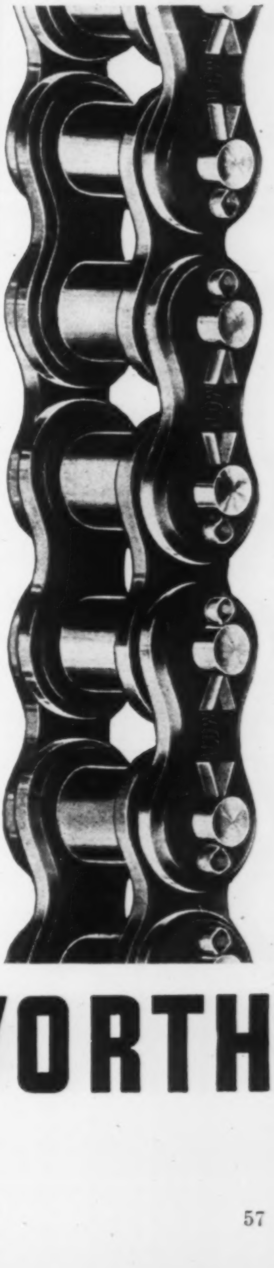
Hydraulic unit of simplified standard fuel injection pumps is furnished as a sealed assembly

Incorporated as an integral part and located on top of the fuel injection pump is a secondary filtering unit. Fuel oil must pass through this filter before entering the hydraulic unit. A two-step filter is employed, the first being a specially woven wool fabric and the next a spirally wound edge filter. A fuel transfer pump is available for delivering oil to the injection pump if there is not sufficient gravity head.

Welding Head Is Adjustable

A SMALL motor drives the electrode feed rollers through a simple worm reduction gear and three-speed transmission in the improved automatic arc-welding head of General Electric Co., Schenectady, N. Y. At any of the three

How to make ROLLER CHAINS *Last Longer*



Baldwin-Duckworth—and other—Machine Finished Roller Chains show increased efficiency, lower unit cost and give greater general satisfaction when they are *properly installed*.

Worn-out sprockets, sprockets whose hubs aren't bored true, sprockets with improper or inaccurately cut teeth *shorten chain life*. They don't deliver the full service that you should get from them.

The use of Baldwin sprockets will definitely lengthen the life of your roller chains. An improved tooth form provides maximum efficiency. Hubs are bored absolutely true. Great care is used in the selection of steel, and in the heat treating process to obtain long wearing qualities in the sprocket without the extreme hardness that is bad for the chains. **Steel plates, steel castings, steel forgings, and cast iron are some of the materials used, depending on the specific application.**

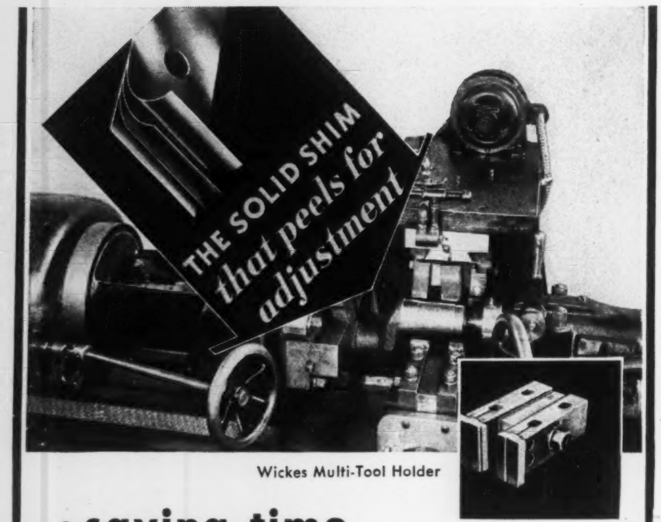
If you want the longest possible life and the greatest efficiency for your power transmission or conveying drives you will do well to use Baldwin-Duckworth roller chains and sprockets, as recommended by our engineering department.

There is a Baldwin-Duckworth distributor in every important industrial centre.

BALDWIN-DUCKWORTH CHAIN CORPORATION
365 Plainfield Street **Springfield, Mass.**

BALDWIN DUCKWORTH

Factories at Springfield and Worcester, Mass.



• saving time
in accurate adjustment of cutting tools

. . . no miking, no filing required to obtain precision adjustment of cutting tools. You just p-e-e-l the laminated brass shim! More accurate . . . more convenient . . . but LESS expensive to use. May we show you?

LAMINUM

LAMINATED SHIM COMPANY, INC.
2126 Forty-fourth Ave., Long Island City, N. Y.

510

THE HEART OF POWER

Supplying "Life Blood" to the cutting edge of machine tools

The coolant pump is unquestionably "the Heart of the machine tool". When the pump fails to supply coolant satisfactorily, the efficiency of the entire machine is reduced, resulting in costly delays and repairs. It pays to install good pumps to assure utmost protection to expensive tools.

There are Roper Coolant Pumps of all types for handling cutting compounds and lubricating fluids on metal working machines . . . non-pulsating . . . sufficient force to reach deepest cuts and bores . . . guaranteed not to lose prime . . . high or low pressure, delivering 1 to 20 G.P.M.

Roper Coolant Pumps can be designed as an integral part of your machine. Write for Bulletin No. R4MD.

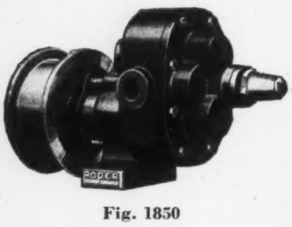


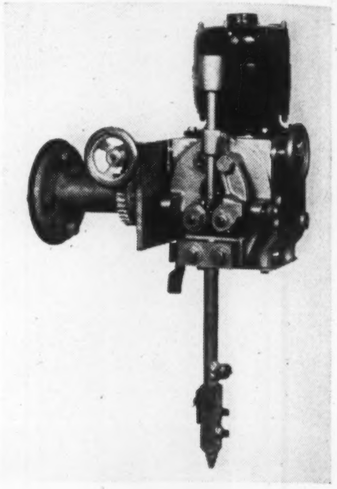
Fig. 1850

Dependable **ROPER PUMPS** *Since 1857*

GEO. D. ROPER CORP., ROCKFORD, ILL.

speeds, selected to suit electrode size, current and rate of deposition of metal, the electrode is fed at a uniform rate and the arc voltage is accurately maintained. The only adjusting element necessary is a small rheostat.

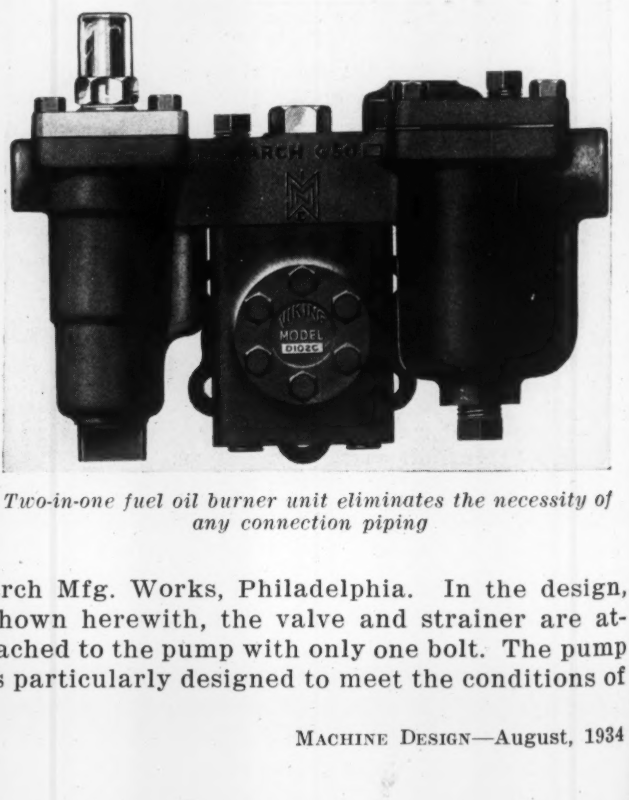
The electrode is positioned with respect to the work by handwheels which swing the nozzle through complete circles in two planes at right angles to each other, thus providing universal motion of the head.



Electrode is fed at a uniform rate and arc voltage is maintained accurately by new automatic arc welding head

Burner Unit Eliminates Piping

ALL connection piping is eliminated by the new two-in-one fuel oil burner unit which combines pump, valve and strainer brought out by Viking Pump Co., Cedar Falls, Ia., and Monarch Mfg. Works, Philadelphia. In the design, shown herewith, the valve and strainer are attached to the pump with only one bolt. The pump is particularly designed to meet the conditions of



Two-in-one fuel oil burner unit eliminates the necessity of any connection piping rotation and location of suction and discharge ports peculiar to any individual design of oil burner, while the design makes possible the streamlining of the oil burner. Units are available in capacities of 10, 18 and 26 gallons per hour.

Printer Will Reproduce Any Copy

ANY one sided copy that is semitranslucent may be reproduced in the same manner as by a camera with reflected light, through a lens, by use of the new photographic printer of Paragon-Revolute Corp., 77 South avenue, Rochester, N. Y. With the machine it is possible to make a blueprint from a blueprint, a tracing of part of an assembly drawing for a detail part drawing, photo copies of letters or drawings and similar reproductions.

Blueprints can be made from other blueprints with improved photographic printer

Photographic material suitable for use on the printer can be broadly described as paper and tracing cloth sensitized with regular and orthochromatic emulsions. The orthochromatic emulsions are color sensitive while the regular emulsions are not.

Hose Resists Action of Solvents

MADE of a newly developed compound possessing all of the strength and flexibility of rubber, but being free of the usual tendency to soften, slough off, break apart or disintegrate when in contact with oils or solvents, a new type of paint fluid hose which successfully resists all commercial solvents has been introduced by Electric Hose & Rubber Co., Wilmington, Del. The hose, of braided and molded construction, is light and flexible and its cover will resist rough wear.

CONNECT

these Low-speed Drives

Directly to Your Machines

SAVE SPACE – REDUCE PRODUCTION COSTS

G-E fractional-horsepower gear-motors offer you compact, efficient, low-speed drives that can be connected directly to your machines or built into them. The entire unit, consisting of a dependable G-E fractional-horsepower motor, and accurately cut helical gearing running in a bath of oil, requires little more space than a standard motor — an important factor in saving room and in making your machines more compact. Both concentric-shaft and right-angle-shaft types are available.

Single-phase, polyphase, and direct-current gear-motors in ratings from 1/6 to 3/4 horsepower and in speeds from 500 to 11 rpm. are available. We also make a complete line of larger gear-motors in ratings from 3/4 to 75 horsepower and in speeds from 600 to 13 rpm.

GENERAL ELECTRIC

SEND FOR COMPLETE INFORMATION

General Electric, Dept. 6D-201, Schenectady, N. Y.

Please send me a free copy of your bulletin GEA-1765, which describes and illustrates your new fractional-horsepower gear-motors.

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COMPANY..........

ADDRESS..........

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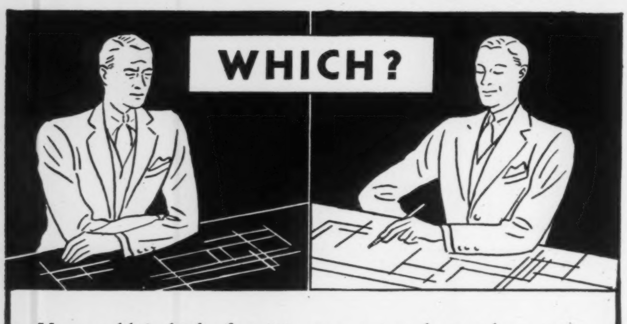
for Large Volumes---
High Pressures

B·S

Two sizes for maintaining pressures on hydraulically operated machines. Tested design and construction assure satisfactory performance. Complete circular sent on request. Brown & Sharpe Mfg. Co., Providence, R. I., U.S.A.

Nos. 53 and 55
Geared Pumps
With Ball Bearings and Spiral Gears

Brown & Sharpe Pumps
Geared — Vane — Centrifugal



You wouldn't think of straining your eyes and nerves by attempting to read ordinary printed matter with poor or insufficient light. Then why use hard-to-read blue prints—especially when *easy-to-read* BLACK AND WHITE PRINTS generally cost no more to make? Remember, too, that pen or pencil notes really *show up* on a BW Print—another big advantage, which costs nothing extra!

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City *State*

BRUNING

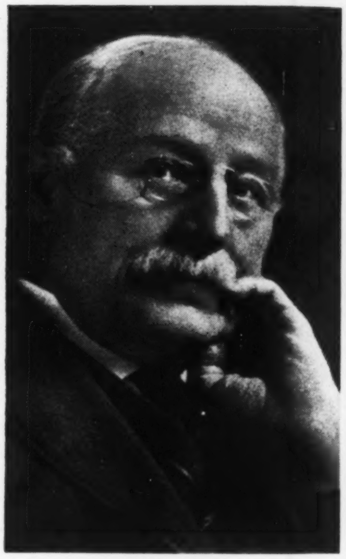
MEN OF MACHINES

(Concluded from Page 42)

ume entitled, "Twenty Million Dollars Every Day." It covers a brief discussion of the basic principles upon which he believes the economic structure of our civilization should rest.

Obituaries

DEATH came last month to HENRY E. EBERHARDT, 82, veteran designer and machine tool builder, in Newark, N. J. His eightieth birthday was commemorated in the May, 1932, issue of MACHINE DESIGN with a biographical sketch. Mr. Eberhardt was a partner in the firm of Gould & Eberhardt Co. from its organization until 1904, when he formed Eberhardt Bros., with his four sons. This company was a forerunner of the Newark Gear Cutting Machine Co., of which he was president. Mr. Eberhardt has been granted many patents on machine tools, and he was active in the development of printing machines for producing United States bank notes. He made the design of automatic machinery his chief hobby. The American Gear Manufacturers' association numbered him among its most esteemed members.



* * *

WILLIAM T. F. JOHNSON, widely known machine tool designer, died recently at Cincinnati. He was 69 years old. At one time Mr. Johnson was vice president and treasurer of Bradford Machine Tool Co.

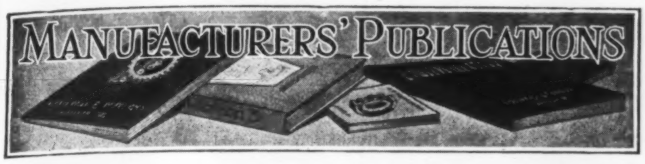
* * *

OLE EVINRUDE, originator of the outboard motor which bears his name, died recently. He was 57 years old. Born in Norway, Mr. Evinrude came to this country in early youth. After a number of years spent in Milwaukee machine shops, he organized the Evinrude Motor Co. in 1909 to manufacture the first practical outboard engine.

* * *

WILLIAM H. BASSETT, metallurgical manager of American Brass Co., and recently elected president of the American Society for Testing Materials, died suddenly on July 21 at Cheshire, Conn. He was 66. Born in New Bedford, Mass., Mr. Bassett was graduated from Massachusetts Institute of Technology in 1891. He was the first to apply the spectroscope to routine work in the nonferrous metal industry and the first in this country to apply the microscope to the metallography of nonferrous metals. MACHINE DESIGN presented a biographical sketch and picture of Mr. Bassett in its April, 1930, issue.

MANUFACTURERS' PUBLICATIONS



BEARINGS—Gwilliam Co., Brooklyn, N. Y., has issued a new catalog, No. 11, on its line of ball and roller bearings including roller thrust bearings, thrust bearings with leveling plates, ball thrust bearings with flat races, thrust bearings with grooved races, thrust bearings with bands, ball step bearings, special bearings, journal roller bearings and metal balls of steel, bronze, brass and stainless steel.

BEARINGS—Shafer Bearing Corp., Chicago, has prepared a most complete catalog, No. 12, on its line of self-aligning roller bearings. Features of the design, typical applications, descriptions and photographs of the units, including pillow block units, and similar information, are included.

BEARINGS—Cageless tapered roller bearing applications in mine and industrial haulage equipment are presented in a new bulletin of Tyson Roller Bearing Corp., Massillon, O. The publication includes photographs of the applications and descriptions of the bearings employed.

CAST PARTS—Brass die castings which are said to have the strength of steel are comprehensively discussed in a recent bulletin of Doehler Die Casting Co., Toledo, O. The bulletin states in illustrations and copy what brass die castings are and what they will do. Three specific alloys are discussed and their physical properties given.

CONTROLS (ELECTRICAL)—Mercoid Corp., Chicago, is distributing a folder on its line of automatic heat controls which incorporate enclosed mercury contact switches. The controls are balanced so that each operation synchronizes into the entire operation.

CONTROLS (ELECTRICAL)—Reduced-voltage starters of the auto-transformer type for squirrel cage induction motors are discussed in bulletin GEA-1979 of General Electric Co., Schenectady, N. Y. The complete line is presented, together with a description of the types and typical applications.

CONTROLS (ELECTRICAL)—Contact combinations heretofore not available are indicated in the new bulletin on relays prepared by Eagle Signal Corp., Moline, Ill. The bulletin includes wiring diagrams, dimensions and contact ratings of the relays in the line.

DRIVES—Reeves Pulley Co., Columbus, Ind., has prepared a unique bulletin, T-6700, on its line of variable speed transmissions. The booklet gives an intimate description of the units, illustrating the points discussed. Also, the advantages of infinitely variable speed transmissions are presented.

DRIVES—The design of special V-Belt drives, the selection of a V-belt drive, standard tables, charts and similar design information are included in the comprehensive V-Belt engineering data book published by Manhattan Rubber Mfg. division of Raybestos-Manhattan Inc.,

MARSH
GAUGES

Here's the Answer to

YOUR GAUGE PROBLEMS!

If your product requires gauges, it will pay you to talk with a Marsh Engineer. He will tell you how Marsh Gauges have helped many leading manufacturers improve efficiency and show substantial savings, too. You will find him prepared to answer any gauge problem and able to give you sound advice in the selection of gauge equipment. Mail the coupon below for our new complete catalog and get acquainted with the Marsh line—the finest gauges built!

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Home Office:
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In Canada: The Jas. Morrison Brass Mfg. Co., Ltd., Toronto

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Shows the complete Marsh Line—a Gauge for every application

Gentlemen: Kindly send me a copy of your new catalog on Marsh Gauges.

Firm Name ....

Address ....

Signed by ....

☐ Check here if you wish a Marsh Engineer to call on you.

MAIL THIS COUPON TODAY!

4 R.P.M. AND UP

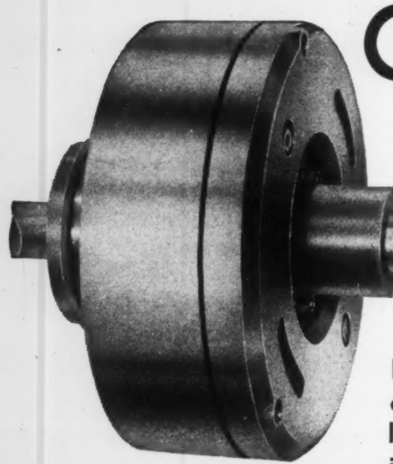
Gear ratios 1089:1 to 36:1. Shaft speeds 4 to 300 R. P. M.

DUMORE Fractional Horsepower Motors are made with built-in gear reduction units. They combine the advantages of light weight, controlled speed and smoothness for low speed applications. Will operate on A. C. or D. C. Write for complete information.

THE DUMORE COMPANY, 100 Sixteenth St., Racine, Wis.

DUMORE FRACTIONAL HORSEPOWER MOTORS

Dings Magnetic Clutches



Backed by the Oldest Experience in Building Magnetic Equipment!

Here is where experience means something! It pays out in correct installation, lower cost operation and longer life. Since 1899, Dings engineers have been solving all kinds of transmission, separation and special problems.

Here is the greatest magnetic experience that can be secured for solving *your* clutch problem. There is no cost in taking advantage of it. Let us work with you and your engineers.

Dings Magnetic Separator Co.
666 Smith Street, Milwaukee, Wis.

DINGS MAGNETIC CLUTCHES

Passaic, N. J. Photographs and application information complete the presentation.

MOTORS—Imperial Electric Co., Akron, O., is distributing bulletin No. 1040, describing the advantages of its line of motors and the method of construction.

MOTORS—Holtzer-Cabot Electric Co., Boston, has issued a complete leaflet on type RWS split phase motors which are designed for use on such equipment as production machines, light machine tools, office machines, fans and blowers, motion-picture projectors, generators, oil burners, electrical controls and medical apparatus.

PUMPS—Duriron Co., Dayton, O., has published bulletin No. 172 on its new series of centrifugal pumps for acids and alkalies. Included in the bulletin is a brief analysis of the different corrosion-resisting alloys in which the pumps are procurable.

SHAPES—Turned and ground shafting is the subject of a recent folder of Union Drawn Steel Co., Massillon, O. The bulletin gives the advantages of the shafting, its characteristics and its properties.

STEEL (METAL-CLAD)—Ingersoll Steel & Disc Co., Chicago, is distributing a 16-page booklet entitled "Manual of Welding and Fabricating Procedures for IngAclad Stainless Clad Steel." In addition to complete information on the fabrication of the metal and the specifications for fabricating, the booklet includes illustrations of typical applications, the method of producing the sheet and physical properties.

WELDED PARTS AND EQUIPMENT—Electronic contact timers for spot welding are presented in a catalog insert of Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Distinctive features, operation and construction of the timers are given.

WELDED PARTS AND EQUIPMENT—"101 Uses for the Air Acetylene Flame," is the title of a new booklet being distributed by Linde Air Products Co., New York. The booklet takes up in succession a number of different fields where the process is useful.

Research Publications

The Bearing Value of Rollers, by Wilbur M. Wilson. The bearing value of rollers such as those of the type used as expansion rollers and rockers of girder and truss bridges, as defined in this bulletin, is the load producing a plastic flow of 0.001 inch per inch when the roller is rolled 1000 strokes at the given load. This criterion may seem somewhat arbitrary, but has been adopted because the curve showing the relation between load and plastic flow does not contain a definite "break" and it seemed desirable to have some criterion for determining the bearing value that would not involve the "personal equation." It does actualy determine as the bearing value a load such that increeases beyond this load are accompanied by a rapid increase in the rate of plastic flow. Published as bulletin No. 263 by Engineering Experiment Station, University of Illinois, Urbana, Ill.

Noteworthy Patents

(Concluded from Page 46)

connected to the end of shaft 5 creates a suction in elbow 20 and draws the pulverized material upward, depositing it in hopper 15.

If the machine is to be used as a corn cracker, rotation of the shaft 5 is reduced, thereby causing centrifugal action of the hammers 11 to be likewise lowered. Corn fed into the hammer mill is broken into particles of various sizes, many being relatively large plus some additional finer material caused by the hammering operation. This finer material is drawn upward through elbow 20 and deposited in hopper 15 in the usual manner, even though door 24 is in open position. However, the heavier particles which comprise the cracked corn will fall through opening 23 in the bottom of the elbow. The patent is designated No. 1,960,346.

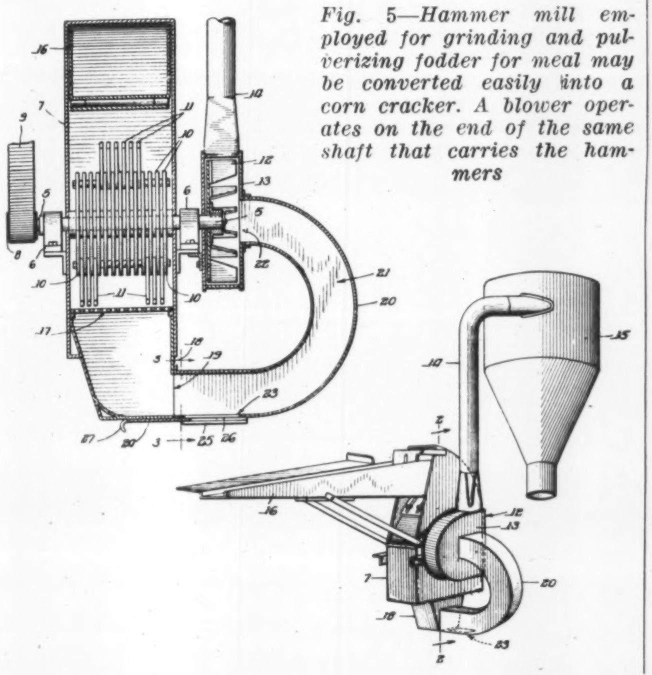


Fig. 5—Hammer mill employed for grinding and pulverizing fodder for meal may be converted easily into a corn cracker. A blower operates on the end of the same shaft that carries the hammers

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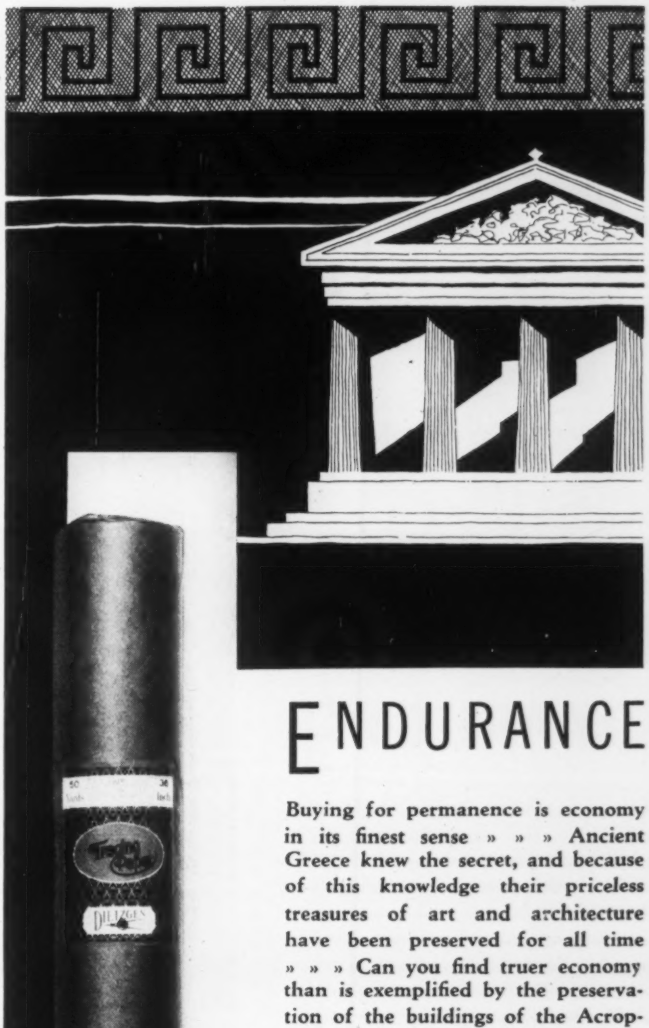
VIBRATION DAMPENER—1,965,224. This invention relates to milling machines and more particularly to mechanism for minimizing vibration and chatter. Assigned to Cincinnati Milling Machine Co., Cincinnati.

KNOT TYING MACHINE—1,965,023. Improvement in a knot tyer are covered by this patent. The unit is adapted to join two strands by knotting each strand about a single thickness of the other strand in such a way that the two knots when drawn together, reinforce each other against displacement of the knot by tension in the united strand. Assigned to Abbott Machine Co., Wilton, N. H.

AUTOMATIC CONTROL MECHANISM—1,963,082. Designed for can making machines, the invention provides a rotating mechanism controlled by the cans received from the machine with which it is associated. Assigned to Continental Can Co. Inc., New York.



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These articles all appeared in series form in MACHINE DESIGN. Because of the interest they aroused, and the permanent value of the subject matter, they have been made available in reprint form. They may be secured for 15 cents each. Please enclose remittance with order.

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MACHINE DESIGN is a monthly technical publication conceived, edited and directed expressly for those executives and engineers responsible for the creation and improvement of machines built for sale, and for the selection of the materials and parts to be used.

BUSINESS ANNOUNCEMENTS AND SALES BRIEFS

LOUIS ALLIS CO., Milwaukee, manufacturer of electric motors and similar equipment, has moved its Pittsburgh office to 537 Oliver building. The office is in charge of J. F. Rodgers.

* * *

R. E. S. Geare, formerly chief engineer of L. H. Gilmer Co., Philadelphia, has been elected vice president of the company in charge of sales and engineering.

* * *

General Automatic Lock Nut Corp. has been reorganized and its business hereafter will be conducted under the name of Automatic Nut Co. Inc., Chrysler building, New York.

* * *

W. S. Gallagher, sales engineer for Ex-Cell-O Aircraft & Tool Corp., Detroit, has opened a new sales office at 1807 Elmwood avenue, Buffalo, N. Y.

* * *

Allis-Chalmers Mfg. Co., Milwaukee, has removed its Chicago district office to the New Field building, 135 South LaSalle street. B. F. Bilsland is manager of the Chicago district.

* * *

George C. Green has joined the technical staff of Acheson Colloids Corp., Port Huron, Mich. Mr. Green will be located in New York city, where he will be first assistant to Raymond Szymanowitz, technical editor of the company.

* * *

Malcolm E. Gregg, since 1928 assistant district sales manager for the Milwaukee office of Inland Steel Co., Chicago, has been appointed district sales manager, succeeding the late Harry L. McCauley.

* * *

Arthur C. Geldner has been appointed district sales manager in the Pacific Coast territory for Union Drawn Steel Co., Massillon, O. He will maintain offices at 915 Edison building, Los Angeles, with sub-district offices in San Francisco and Seattle.

* * *

Anaconda Sales Co., subsidiary of Anaconda Copper Mining Co., Anaconda, Mont., has taken over sales of all metals and metal products manufactured by the latter, succeeding United Metals Selling Co., another subsidiary. This places sale of all products of the Anaconda group under the Anaconda trade name. Fabricated products of American Brass Co. and Anaconda Wire & Cable Co. will be sold by those companies.

* * *

W. J. Hanna has been appointed district sales manager at Chicago for Republic Steel Corp., Youngstown, O. Mr. Hanna was formerly in the company's Detroit sales office.

* * *

Moxie S. George is now associated with Inland Steel Co., Chicago, as salesman in the company's Milwaukee office.

* * *

Sivyer Steel Casting Co., Milwaukee, has announced the opening of a New York office at suite 810, 500 Fifth avenue, in charge of A. N. Diecks.

* * *

Delta-Star Electric Co., 2400 Fulton street, Chicago, has been granted a patent license by General Electric Co., Schenectady, N. Y., to manufacture oil-blast oil circuit breakers.

* * *

Levitan Mfg. Co., Brooklyn, N. Y., manufacturer of electric wiring devices, has established Pacific Coast headquarters in the Stewart Dawes building, Eighth and Santee streets, Los Angeles.

* * *

C. A. Macfie and C. C. Felton have been appointed vice presidents of Revere Copper & Brass Inc., New York, with offices in the New York Central building, 230 Park avenue. Mr. Felton was formerly sales manager of Calumet & Hecla Consolidated Copper Co.

* * *

Phelps Dodge Copper Products Corp., 40 Wall street, New York, has licensed Cramp Brass & Iron Foundries Co., Paschall station, Philadelphia, for the manufacture of PMG metal sand castings in the states of New York, Pennsylvania, Maryland, New Jersey and Delaware. Canadian Bronze Co. Ltd., Montreal, now have the exclusive right to manufacture of PMG metal in Canada. PMG alloys, made by alloying PMG hardener with copper, are being used in the manufacture of gears, needle valves, bearings, pump shafts, rods, etc.